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ABSTRACT

Tips are given here for energy conservation in the home. Included are heating and cooling houses, water heating, bathing, clothes washing and drying, cooking, refrigerating, dishwashing, lighting, and driving. Also included is a table of annual energy requirements of household electric appliances. (BB)

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SOME BASICS

THE ENERGY PROBLEM IS REAL.

Ignore rumors that the energy crisis is just an oil company rip-off; or that it is a trick by oil importers to control our foreign policy. Forget about oil and gas deals with Mexico. Forget oil from the North Slope. Forget new offshore discoveries. None of this makes a dent in the hard fact that the world is running out of oil, but not out of people. Think of it this way: There are two lines on a graph. One is population, going up; the other is oil, going down; sooner or later the lines had to meet. They did.

IT IS A PROBLEM WE CAN HANDLE, BUT IT WILL BE WITH US A LONG TIME.

For twenty years we sloshed through an energy binge, using more and more, and putting all our energy eggs into the oil basket. Even today we consume a good third of the world's energy supply, yet we are only 6% of the world's population. True, we have built a high standard of living with that energy, but notice: In some European countries, the standard of living is about as high, but the per capita energy consumption is only 1/2. The rest is waste. We must learn to separate needs from greeds.

The problem will not just go away, and even with hard work, it may be with us for good. We are not out of oil yet. By cutting back on waste — way back — we can get by on what we have left at home, plus what we can buy abroad. In the meantime, we will use our technology and our common sense to develop new sources of energy; the most promising is solar (see p. 3). The least promising is that comet of energy sources, nuclear power. The tail of that comet packs a load of dangers — astonishing dangers. Take nuclear wastes. Their half-life is about 20,000 years; this means that 20,000 years will pass before the level of radiation goes down to one-half what it is today. Then it will have to go down several more half-lives before it reaches a safe level. By then, hundreds of thousands of years will have gone by. During all that time, we will have to keep it under guard. Who wants to saddle future generations with all that? This is just one example of why nuclear energy is a nowhere solution to our problem. One is enough.

CHANGING OUR HABITS We are bundles of habit. We have to be, because being human gives us so much to think about. Otherwise, we would go crazy having to re-think, every day, each detail of our lives. Changing those habits is what we must do first. They may seem like drastic changes at the start, so much have we come to EXPECT a life of ease.

Advertisers have drilled it into us, teaching us to pamper ourselves with conveniences that we

"need," comforts we "deserve," and luxuries we should "choose." Only occasionally does a story in the news fix our attention on that "other half" of the world, where millions suffer and die for want of a few simple NEEDS. Then we may ask ourselves, What do we need? What do we deserve?

Whatever you decide about these most basic questions, you must do it in the privacy of your heart and mind. But enough of us *will* change our ways, or we will all face a dismal future. It will be a future of hardship. And it will be one without many of the freedoms we have today, because some governmental authority will be forcing us to live within our energy means.

Accomplishing the needed changes in time does not have to be too difficult, and the total adjustment in our lifestyle will not actually be very great. Energy happens to cost money. So if someone can be persuaded to save only money — by saving energy — that person will still help the environment and our energy supply. This will take the investment of some time and money. But these are measures that will pay for themselves — some sooner, some later.

THE GADGET AGE We might think of electric gadgets as a kind of symbol, standing for the American way of life. They say something about what we expect from life, and how far we have come in demanding more and more ease. Once, an electric mixer was about the only such item in a home. But today . . . TODAY! Before you start an energy-cutting plan, go around the house and list all the things that use electricity. Prepare to be amazed. A typical appliance doesn't use much energy — that's not the problem. The problem is in the NUMBER of them we have.

Now, certain persons, because of handicaps, might NEED some of these. But for the vast numbers of us who are under-exercised and overweight, do we? Do we NEED electric can openers? Electric ice crushers? Electric tooth brushes? Electric ice cream makers? Electric carving knives? Electric brooms? Electric knife sharpeners? Electric bun warmers? Trash compactors? Do we need glass frosters and crepe makers?

No two appliances will use the same amount of electricity and have the same life, even when the ratings are the same. Uncle Sam tests several makes and models before buying for federal installations. If you want to know exactly which models finally get bought, contact: Consumer News, Inc., Room 3300 National Press Building, 300 Independence Ave., S.E. 20003. The heaviest drinker of electricity is the one with a heating element; if it plugs in and heats up, it costs you plenty. Our total energy cost for all home appliances is about 25% of the total home energy bill. This includes both gas and electric, stoves, washers, and dryers.

STARTING OUT RIGHT Some of the information in this book applies more to homeowners than apartment dwellers. But even if you live in an apartment now, someday you may be moving into a house.

- Planning to build or buy? *Where* the house is built can be as important to energy-saving as *how*. Examples of what affects it: orientation to the sun, vegetation, hills and valleys, prevailing winds. Read up on the subject. Some places to start: *Your Energy-Efficient House: Building and Remodeling Ideas* (Garden Way Publishing Co.); *Low-Cost Energy-Efficient Shelter* (Rodale Press).
- Building or remodeling? Architects who keep up with new developments can use many of the new features to save energy. Some of these are really old features. If your architect cannot do this, then change architects.

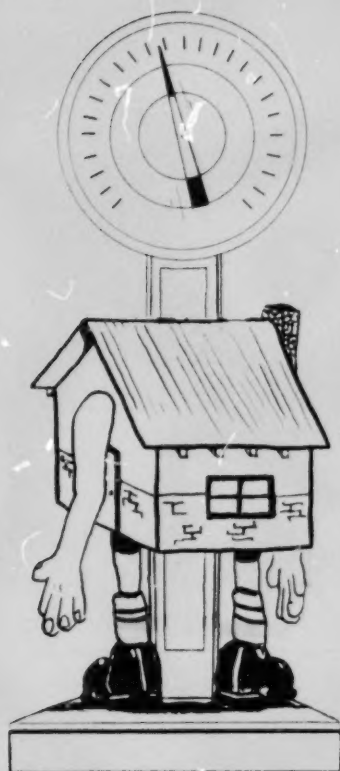


Adding up the appliance bill

HOW MUCH YOU CAN SAVE With only a little effort and investment, and not much change in lifestyle you can save 20%. Make a little more effort and save 30%; if you are now spending \$90 a month for energy (including gasoline), the savings will be \$27 — that's \$324 a year! Really bear down and save 50% — 60% — even more!

THE ENERGY DIET An energy-cutting plan is something like a diet: you have to set reasonable goals, then check up frequently to see how you are doing. Don't be discouraged at first. Remember that habits are hard to change, and that there may be quite a time lag between your efforts and the results in the bill.

"Crash" diets usually don't work very well, either. For example if you change the thermostat drastically, you will soon bounce it back to where it was. But change it gradually, as the family adjusts. Before long everyone will be wondering why so much heating/cooling was "needed" before.



R.G.

An energy diet for the house

HOW TO CHECK UP ON WHERE YOU ARE GOING

The bills tell the main story you want to know. But there are some good reasons for using the meters (electric and gas) yourself. The meters themselves are not likely to be out of whack — that happens only very, very rarely. But the meter-readers don't read a particular meter on the same day each month. This can throw off the feedback on how you're doing. Also, you may want to read the meters more frequently than once a month. If you're trying out something, and want to know what effect it has, you can take a reading for whatever period you want. However you do it, keep a graph, and post it where the whole family can see it. Make it a game, a contest.

ZEROING IN ON INDIVIDUAL APPLIANCES

For an electric appliance you can use the number of watts — this is usually marked on the appliance. If the marking shows amps instead of watts, just multiply the number of amps times the number of volts (usually 110 in most areas of the country). For example, an appliance that uses 2.5 amps would use 275 watts (2.5 x 110). If you don't trust this method, use the meter. This can be a little tricky, because in order to check one thing, you have to turn everything else — but everything else — off. This is not a convenient way to check watts, but you can easily check on how one appliance draws, compared to another. Just count the number of times the disc goes around in a minute (or in 5 minutes for a low-wattage item). Nit-pickers can buy what electricians use, but it costs about \$50. It is called an amprobe. To check a gas appliance you will have to turn off even the pilots. And those pilots — even they can surprise you on energy-drain.

OFF-PEAK RATES In some areas, electricity is offered at a reduced rate during peak periods of reduced demand (usually late night, very early morning, and weekends). Saving heavy-draw activities for these times will save you money. It will also save on the earth's precious stored energy, because the power company must burn extra fuel to force-feed the lines during peak hours.

SOME OTHER UPS AND DOWNS OF ELECTRICAL USE

Every time an electrical unit is turned on, there is a momentary extra surge of electrical drain. The more watts, the higher the drain. Electric motors are especially prone to do this. These surges can be evened out by an apparatus attached to the electrical system. It was originally developed for businesses and industries, but is now beginning to be available for the home. It is found under different names in different localities. Try: Power Master, Alco, Energy Control Products, or check the Yellow Pages. It costs about \$200 for the typical home, and saves an average of about 8%; in a home with high electric bills, it will pay for itself in about two years. While you're trying to come up with the \$200 you can save a little by avoiding turning on many things at once — these sudden loads zap the meter into a spinning spree.

LOW HOUSE POWER Your house probably has this problem if the lights momentarily dim when a motor starts up, like in the refrigerator, air conditioner, or furnace blower. This wastes electricity. It is often found in older houses, built before we decided that we "had" to have this and that appliance. You will either have to lighten the load drastically, or have the house re-wired. The way that is cheaper and more fun is to lighten the load. Try that first.

GAS FLAMES — BLUE AND STEADY

All gas fixtures should burn with a steady, blue flame. If one does not, try clearing around the air vent. If this doesn't work, an adjustment may be needed. But don't try to adjust it if you don't know what you're doing. Learn how to do it right, or call in an expert.

THE WIND IS FREE Wind power in most places (and water power in some) can supply all or part of your home electricity. Yes, wind! It has been done for decades. A wind generator will pay for itself in about 10 years. A wind system is usually hooked up to a bank of storage batteries to even out the current. Or it can be connected to a device that draws what is needed from regular power lines when the wind is down. Some — but only some — power companies will let you "run the meter backwards," meaning to sell them your surplus when the wind is up.

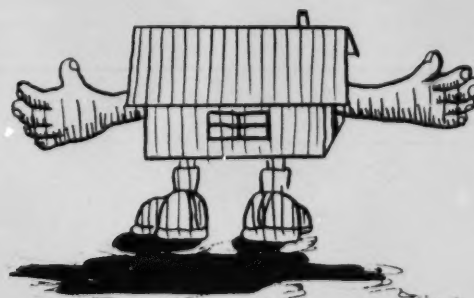
Research is underway on huge wind generators for community needs, but if you want wind power now, on your own, start by reading up on it. See, *New Low Cost Energy Sources for the Home* (Garden Way Publishing Co.), *The Mother Earth News Handbook of Homemade Power* (Mother Earth News), and, *Wind and Wind Spinners* (Rodale Press).

THE SUN IS FREE In truth, all energy on earth is solar energy — even the energy that you are using to turn the pages of this book. For example, if we use wind power, what makes the wind go in the first place is solar energy. Burn wood, and you are using the solar energy it took to grow the wood.

When we use fossil fuels (oil, gas, coal) we are like pumping up old solar energy from the earth — a savings account that Mother Earth put there millions of years ago. Once it is gone, it will be gone forever. Now, fossil fuels are unique. Nothing beats them as building blocks for useful products — a great variety of them — like plastics, medicine, and clothing. So does it make sense to send such precious resources on a one-way trip into the atmosphere, just to get heat and power? No! Especially not when other energy sources are so abundant.

One of the most ideal sources is direct solar energy. It is clean. It is inexhaustible. It wastes nothing. We do not have to wait for a scientific breakthrough to use it, because much of the technology is simple and well-known. For homeowners there are solar heating/cooling systems (yes, cooling) and solar hot water heaters, for starters. These are available *now*, very likely in your area — local companies that provide them are popping up so fast the Yellow Pages can't keep up with them.

Solar installations are not cheap, but only the *installations*. Once the system is installed, the energy to run it is *free*. Think of it. The field is growing so fast that there is now an information center that can tell you almost anything you want to know about it, including what is available in your area: National Solar Heating and Cooling Information Center, P.O. Box 1607, Rockville, Md. 20850. Toll-free number: 800-523-2929 (Pennsylvania callers use 800-462-4983). Do some reading up on the subject. Try: *New Low Cost Sources of Energy for the Home* (Garden Way Publishing Co.); *Mother Earth News Handbook of Homemade Power* (Mother Earth News); *Direct Use of the Sun's Energy* (Ballantine Books).



R.G.

HOME HEATING AND COOLING — GENERAL

THE BIGGEST BITE Heating and cooling the typical home costs more energy than anything else — over 50% in most areas. Yet most of the year, most of us live where the weather is only cool or warm. Include parts of days and nights, and figure it up: You will realize that times of extreme cold and heat are short. Our bodies are marvelously engineered to handle the rest. A question of habit: learn to get along without air conditioning and heating except when you NEED it.

Besides, in most people, sudden changes in moving from cold to hot places, or vice versa, makes for more colds and similar infections. Keeping the temperature inside your home nearer the one outside is likely to reduce illnesses in both winter and summer. Consult your doctor.



R.G.

Kids, doors, energy, and rubber bands

ON GOING AWAY Going on vacation? Turn the heating/cooling system off. Yes, off. The only time to worry at all is in sub-freezing weather. Say you live in Wisconsin, and you are going to spend Christmas away from home. In that case, you'll have to leave enough heat just to keep the pipes from freezing. An unbelievable number of people do it the other way: They go away on vacation leaving the heating/cooling system going full blast just so they won't be uncomfortable the first hour they are home.

Going to be away a few hours? Then turn the heating/cooling to a low level of operation. It does *not* take more energy to get a house comfortable again than it does to keep it comfortable. A lot of people have been wrong about this. The only exception is with a house that leaks air like a screen door, is left a short time, and is left in extremely hot or cold weather. Learn and save!

When a room is not in use, close it off, along with its heating/cooling. But don't go overboard in a house with a central system: Closing off too many ducts can raise the air pressure so high in the remaining ducts as to pop some duct joints. Also, in winter, it can raise the temperature so high in those remaining ducts as to create a fire hazard. And it can waste energy.

KIDS, OTHER FORGETFUL PEOPLE, AND RUBBER BANDS Ever know a child who would close a door after himself/herself? Investing a few dollars in door-closers for outside doors saves a bunch of energy (and how about the parents' nerves?). If you don't want to buy door-closers, try the rubber band trick (described below), but use more rubber.

Who really NEEDS a heated/cooled bathroom all the time? There are small door-closers designed for inside doors, but they are often troublesome and ugly. They're not cheap, either. You can have a bathroom door (or any door) close automatically with a heavy, long rubber band (or combination of smaller ones). Just drive two small nails — one in the door near the top, and the other in the door jamb at the top. Slip the rubber band(s) over the heads. Voilà! You have a door closer, and many energy dollars in your pocket.

And who NEEDS heated/cooled closets at any time? You can use the rubber band trick on hinged closet doors. It will also work on sliding doors if the rollers run freely, and if you use more rubber than you need for a hinged door.

WHAT SHALL WE DO ABOUT THE WINDOWS? Glass is a poor insulator. If you want to look out a lot, you have to take the other side of that trade-off: higher bills for heating/cooling. There are some things you can do, but nothing beats not having the window in the first place:

- Put up storm windows earlier in the year, and take them down later. If you are buying, they will pay for themselves in time, with a cut of about 20% in the heating bill. As far North as Washington, D.C., you get your money back in about 10 years; move to Detroit, and the payout time is about 7 years. If you live below Washington, D.C., you might still consider them — for what little they will save on heating bills, plus what they save on cooling bills. Some homeowners now leave the storm windows up all year. The kind to buy for energy-saving is the one with wooden frames, although the aluminum ones are easier to handle. If your need for storm windows is greater than your money supply, you can use plastic sheeting to convert screen windows, or you can tack it over the window opening. Poliyethylene is cheap, but lasts only one season; vinyl costs more, but will last 3 seasons. Storm windows of some kind remain the best choice.
- Change regular glass to special, thermal glass. It may be double-paned, or even triple-paned. Often more expensive than storm windows.
- Use thermal drapes, and hang them close to the wall. A poor substitute: any drapes made of heavy, closely-woven material.

THAT THERMOSTAT — EVER SO IMPORTANT AND EVER SO

DELICATE Don't "fiddle" with it, as much changing it wastes energy. Are you getting correct readings? Being near a door or window, or in a draft can affect it. And it just could be "off." Find out by buying an inexpensive (but not cheap) thermometer and checking various places around the house. Is the thermostat clean? Once a year, clean it inside with a soft brush, c-a-r-e-f-u-l-l-y.

SEALING UP SOME SAVINGS

All houses leak air — and almost all leak too much. A certain amount of air exchange is needed for breathing, but usually a house gets from 2 times to 10 times more than it needs. Some of this comes from opening and closing doors. But a lot of it comes from leaks. When a house is built, it is usually pretty well sealed. But with time, the sealing materials shrink and crack. The house "settles," and new cracks develop.

Look for these openings around window frames and door frames, and seal them. Any hardware store has what you need. The doors were probably fitted with metal or plastic weatherstrips. They may have worn out and need to be replaced. This is a weekend job that costs only a few dollars in materials, but it can make a big difference in your energy bills. A crack of 1/8" around a door is the same as a hole 6" across! These openings are most serious in winter, when the temperature difference is greatest between outside and inside. But they waste energy in summer, too.

Some places that often get overlooked: doors to unoccupied parts of the house (like the attic or a storeroom), cracks between upper and lower window sashes, and basement windows in general.

Where not to seal: A house has some holes that were left deliberately to prevent moisture buildup. These are called, "weep holes." You may notice them along a bottom row of bricks, or at the bottom of storm windows. Leave them be.

WANTED: HOUSES WITH DRY CRAWL SPACES (HOUSES ON SLAB FOUNDATIONS NEED NOT APPLY)

A "crawl" space is called that because that is exactly what you have to do when you work in one on the underside of the house. A crawl space or a basement needs a lot of "dry." It also needs some ventilation to keep it that way, and to help control temperatures. Otherwise, it's bad news for the energy bills. For example, if there is bare dirt in the crawl space, it can act like a giant wick, putting too much moisture into the house. In summer this makes you feel hotter, and demand more air conditioning. In winter, it can cause other problems unrelated to energy.

If the dirt in the crawl space feels dry to the touch, don't let it fool you. Dig down a few inches and see what you find. If there is moisture, the dirt needs to be covered with a vapor barrier. Buy plastic sheeting made for this purpose. Just roll it out, overlapping and weight it down with gravel. That's an easy remedy compared to what may have to be done if you have moisture seeping through a basement wall or floor.

Once the moisture problem is under control, the crawl space should be fitted with vents that can be opened and closed. Generally, they should be closed in winter to cut down on chilling the floor. Then in summer they should be opened to keep the under-house area dry.

UNBLOCKING THE AIR TRAFFIC

If the cooled/heated air comes out anywhere except the ceilings, don't put furniture or drapes (or yourself) in front of the registers. This cuts down on the free movement of air, and leads to extra demands on the heating/cooling system. The ducts may also need to be cleaned out every few years. This is definitely a job for professionals.

"WHITE ELEPHANTS" AND

ENERGY If you have a large house, the ducts can often be fitted with automatic dampers. One type is controlled by a thermostat to keep the temperature at a certain level. Another is a clock timer to open and close the damper completely at certain hours. These controls are best installed by professionals.

ENERGY-SAVING MONEY THAT GROWS ON TREES

You can plant yourself up a bunch of savings, if you plant the right things. Take deciduous trees. They're the kind that lose their leaves in winter. All you do is plant them around the house and wait a few years. The best sides to put them are the South and West. In summer they shade the house, which means that it heats up less by radiation. They also cool the air by evaporation from their leaves.

There's more! In winter they lose their leaves, letting the sunlight through to warm up the house. What more perfect combination could you ask for? The only drawback is waiting for the trees to grow. Fortunately, some varieties grow faster than others. Check with local nurserymen.

You can also plant dense shrubbery next to the house. This will help block winds and reduce air leakage into the house. If you want to know more about all this, get the book, *Design with Climate* by Victor Olgyay.



Friendly trees

ANOTHER GIFT FROM MOTHER NATURE

Wide eaves, especially on the South side of the house, is one of the simplest ways to let the sun help you. In summer, when the angle of the sun is high, the eaves block the sunlight from coming into the windows. In winter, when the angle is low, the eaves are not in the way, so they let the sunlight in. See how easy energy-saving can be? If you already have narrow eaves, all is not necessarily lost. With luck your roof will be giving out soon, and that will be an ideal time to have the eaves extended. Or do it yourself.

HELLO, INSULATION Does your house need it? Yes! Does it already have enough? Probably not. Most houses were built before the energy crisis, so builders have begun to use enough insulation only recently. The worst-insulated houses of all are old ones, built before FHA regulations came along.

How do you tell if your house already has enough? One way to check the attic insulation, if you live far enough North, is to notice how the snow behaves on your roof. If it melts much faster than the snow on neighbors' houses, yours is probably under-insulated. Attic insulation is usually easy to get to, so you check its thickness against your snow observations.

How to judge the walls: If an outside wall just feels cold when you're near it, that probably means there is not enough insulation inside. A more accurate way is by using a simple thermometer — one that is mounted on a thin backing. The test works like this: Pick a time when it's at least 20° colder outdoors than indoors. Choose a room that has both an outside wall and an inside one. You stay inside for this test. Hang the thermometer on the outside wall, then on the other one. The difference in wall temperatures should not be more than 1½° for each 10° of difference between indoors and outdoors. Confusing? Well, suppose it's a frigid 20° outdoors, but in your house it's a toasty 70° (air temperature). Hang the thermometer on an inside wall and give it time for an accurate reading. Let's say that it reads 68°. Then move the thermometer to an outside wall. The temperature should not drop below 60½°:

Indoor air temperature:	70
Outdoor air temperature:	20
	50

5 x 1.5 7.5

Inside wall temperature:	68.0
	-7.5
Outside wall temperature:	60.5

WHERE THE HOUSE NEEDS INSULATION, AND HOW MUCH

More or less, a good job in the attic can save 40% on the heating/cooling bill; in the walls, 10%; under the floors, 15%. Any is better than none. Too much is just a needless expense — otherwise it won't hurt anything. The figures on how much is enough are kind of slippery because several things affect them: climate, location, construction, type of heating/cooling. But here are some general guidelines. You should check with local suppliers (check with more than one) on how much and which kind builders are using in your area.

- **Attic** (above the ceiling, or above the ceiling of the uppermost floor) — Here you need from 3" to 15" (it's a long way from Southern Florida to Alaska). Houses with electric heat have more insulation because electric heat is so much more expensive than other kinds.

Heat rises, so attic insulation is the most important kind in winter. In summer it lowers the peak of heat-transfer. It delays the peak, and spreads it out over a longer period. This adds up to less demand for air conditioning. A house with an attic big enough to be lived in will nearly always be located in a cold climate; a lived-in attic will need an additional 6" or more between the roof joists.

- **Walls** — The usual inside thickness is 3½", or the width of standard 2 x 4 studs (2" x 4's" are actually 1½" x 3½"). Some energy-conscious builders today are beginning to use 2 x 6 studs. But that won't help if you're adding insulation. If there is some in the walls, but not enough, it could be because the builder used thin batting; or if it was the loose type, it could have settled over the years, leaving none near the top. Don't overlook a wall with an unheated garage or storeroom on the other side.
- **Floors** — If floors feel cold in winter, they make you demand more heat. If there is enough crawl space under the house you can insulate the floor from underneath — 2" minimum. But insulating the foundation stops the cold before it comes into the crawl space, and costs less than insulating the floor. Some crawl spaces will be so cramped that doing the floor is the only practical way. Cold-water pipes in the crawl space create a special problem in a very cold climate: They may freeze if you bundle the place up too tightly. You can get around this by wrapping the pipe with a special thermal tape. It has an electrical heating element, and can be controlled with a thermostat. It's much cheaper than keeping the whole crawl space warm just to protect the pipes. Do carpets help? Yes, some. They don't actually insulate as much as they seem to, but any covering on floors, walls, or ceiling will help some.

- **Ducts** — If your house has a central heating/cooling system, the ducts are in trouble if they are not insulated. Think of all the summer cooling they lose if they have to pass through an oven-like attic; or the winter heating they lose by going through a frigid crawl space. They need at least 1½" of insulation.

SHOULD YOUR FAMILY ATTEMPT A DO-IT-YOURSELF INSULATION JOB?

It depends on how clever you are about doing things for yourself, and how much there is to do. An ordinary attic insulation job is the easiest. You just lay out the batts between the rafters. Or if you install the loose kind, just dump it out of the bags and spread it around. Don't put your weight between the rafters, or you may be leaving the attic by a way you hadn't planned. With fiberglass and asbestos types, wear a mask with the right kind of filter, because once the stuff gets into your lungs, some of it may never come out. The cheapest material is cellulose (actually ground-up scrap paper); see that the packages bear the NCIMA label; otherwise, it may not be properly fireproofed.

Walls are much harder, and require special equipment and know-how. A house that has no insulation in the attic will probably not have any in the walls either, so you may still have to call in the experts. Professionals can buy the materials wholesale, but you can't. So the cost may be about the same anyhow.

Whether you do the job yourself, or have it done, insulation is so important that it will pay for itself in 1 - 4 years. If you do it yourself, start by reading up on it in do-it-yourself books and magazines. If you have it done, make sure you understand exactly how much of what is going to be put where. Suddenly there's a big demand for something — insulation — and up pop the rip-off artists. Make sure you don't get taken.

HEATING

CENTRAL HEAT OR THE OTHER KIND?

Central heating is the more popular system, but it is more energy-expensive than wall heaters. This is because producing heat in one place and then delivering it all over the house takes more fuel than to make the heat where and when you want it. What you can do:

- Avoid central heat when buying or building.
- Convert (usually costly)
- Open and close ducts to deliver the heat where you actually NEED it, and at the times you choose. This can be done by automatic controls on the ducts, operated by temperature and/or the time of day.
- Work your central system in the most efficient way possible. This is the choice most people will have to take.

FROM EXPENSIVE JUICE, ELECTRIC HEAT

Electric heating costs about three times as much energy as natural gas. Houses with electric heat are usually the best-insulated, but that's not enough help. To make the pill even more bitter, some power companies penalize the customer with higher rates in summer. This may happen if the homeowner uses air conditioning so much that it runs the consumption over a certain level. It's a mess — and the remedies are costly. One is to convert to gas or heating oil; or to solar heat, which is the most expensive of all (but only the conversion — see page 3). Another is to produce at least some of the electricity yourself. See page 2. In the meantime, about all you can do is to keep the system clean, and use less heat.

THE HEAT PUMP, AND THE FUNNY-SOUNDING IDEA OF PUMPING IN HEAT FROM THE COLD OUTSIDE

It's an air conditioner in reverse. And it works. When the air outside is, say, 30°, is there any heat left in it? Yes, more than you would think. In fact there is still heat in anything all the way down to absolute zero (about -460 F.). All the heat pump does is to concentrate the heat that is left in the air outside, and bring it inside. It's the same thing an air conditioner does, only in reverse. There is no fuel burned, so the only cost to you is for the electricity to run it. Now, electricity is expensive, both to you and to the environment (see page 33). So for everyone to come out right, the heat pump has to be very efficient. And it is. With some recent improvements, the heat pump can now save you as much as 60% on your heating bill. So far, not very good for bitterly cold winters.

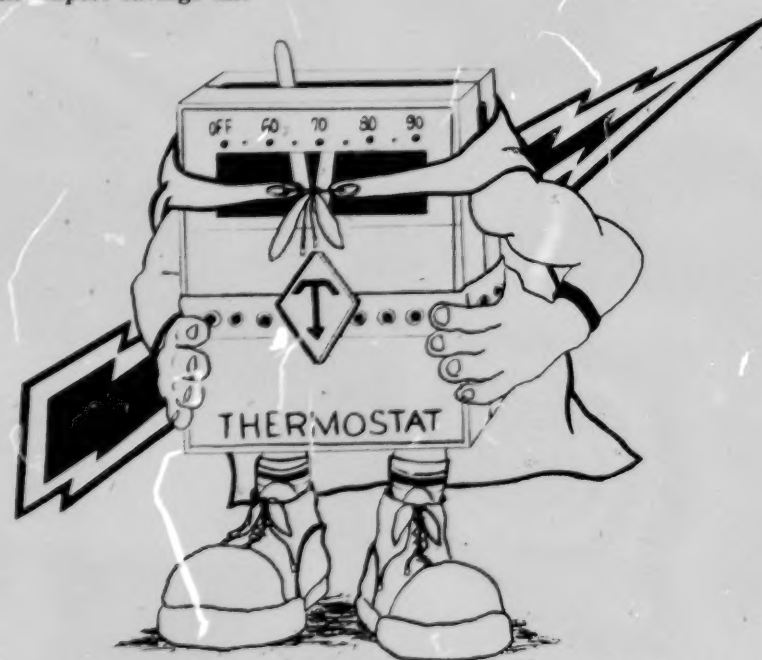
SOLAR HEATING, TOMORROW'S ENERGY TODAY

In the form of sunlight, more energy floods the earth in a minute than all the people in the world use in a year. Gathering a tiny bit of it to heat your home is not too difficult. Expensive, but not difficult; and if your family is especially good at doing-it-yourself, the installation doesn't need to be very expensive. Your home does NOT have to be located in the Southern states to benefit from solar energy. See page 3.

THE MIGHTY THERMOSTAT — SOME THINGS IT CAN DO

Not many years ago most people considered 68° the normal indoor winter temperature. Gradually we let this figure inch up, and finally came to think 78° as normal. Again, we are creatures of habit. If you live where winters are long and cold, haven't you noticed that you feel uncomfortable in the first weeks of spring, when the temperature warms way up to 50°? Habits. Adjust your habits, and lowering the thermostat in winter can save you on energy, alright, but remember that other things affect the savings. The insulation has to be adequate. The house has to be properly sealed. And the colder it is outside, the more you save by turning the thermostat down. As a general rule expect savings like these:

- From 70° to 70° for 24 hours: about 15%. Now, a setting of 70° in winter often seems colder than the same setting in summer. This is not your imagination! It is because the floor and lower part of the room usually are colder. Hot air rises — remember? Also, there are more drafts. A lot of discomfort like this probably means poor insulation, poor sealing, and/or poor heat distribution. Otherwise, use heavier footwear, and you'll survive beautifully.
- The colder it is outside, the more discomfort: floors and walls will get cold almost no matter what. This means that when it's *not* so cold outside, — like spring and summer — you won't feel as much discomfort at the same setting. So set the thermostat down to 65° - 68° at those times — especially in spring when you've gotten used to the cold — and help yourself to some extra savings.
- From 75° to 68° for 24 hours: about 20%.
- From 75° to 68° for 8 hours (at night): about 10%. Automatic controls can be added to do this job for you, raising the setting a half-hour before the family gets up. Warming up a well-insulated house does *not* take more energy than to keep the house warm.



The mighty thermostat

THE DRAPE-DRAW TRICK On the sunny side of the house, open drapes to let in the welcome sunshine or close them to hold heat in, as needed: daytime — open; nighttime and cloudy days — closed. When closed, the drapes don't limit heat loss as much as they reduce discomfort near the windows. That way, you don't demand as much from the heating system. Thermal drapes, or at least, closely woven ones, do help more, though. Watch that drapes don't interfere with a register or a baseboard heater. A deflector might be in order to throw warm air out into the room. In some cases, drapes should be shortened.



The drape-draw trick

(A LITTLE) NEW LIFE FOR OLD RADIATORS Few homes have steam or hot water heat anymore, but many apartments do. To get a little more heat from a radiator:

- Clean regularly.
- Remove enclosures, and shelves sometimes placed above, in error.
- Put a reflector behind it made of sheet metal, or better, aluminum foil.
- Do NOT apply metallic paint; this reflects the heat back in, instead of where you want it. If already painted with it, remove. Re-paint with any medium-light color, in a thin coat.
- Use a small fan blowing on it, to keep the air circulating.

R.G.

THE UNHEATED GARAGE Does your garage NEED to be heated? Unless the weather is bitterly cold, your car should start. If it won't, the battery could be too weak for the job (assuming everything else is OK). The battery is probably about due for replacement anyway, and will soon fail. The time when it does could be a lot more urgent than when the car is sitting in the garage. Also consider:

- Keeping a light bulb lit under the hood, and the hood closed.
- Using one of the special engine-warming devices sold in automotive supply stores.
- Insulating the outside walls of the garage. Even if the wall between the garage and house is insulated, there is some heat escaping. Insulating the other walls will keep some of it in the garage. Also weatherstrip and seal, just as you did in the house.
- Recapturing some of the heat from the water heater chimney and piping this into the garage. This is done with a special device. See p. 10.

THE KITCHEN RANGE AS SPACE-HEATER This heat is an obvious plus in winter, but don't try to stretch the range into a space heater. It is not designed for that, so it's not efficient. The gas range is also open-flame, which makes it dangerous. Remember that in a proper fuel-burning space heater, the flame heats something, which then heats the air.

EVERGREENS, AND WIND-BREAKING Evergreens planted on the side(s) of prevailing winter winds act as a wind-break: The weaker the wind, the slower the heat leaks from the house. Always buy varieties that are best for your area.

FEEL WARM, BE WARM Warm clothing and warming drinks can do a lot of substituting for fuel-spending. Why, the English have known this for centuries. So have a lot of others. There is less of us in our limbs, so we feel the cold more there. Cover up and save.

KEEP AWAY FROM COLD SPOTS

Just about every house has places that are colder than others. Usually these are near windows and exterior walls. Locate family activities away from these places, and there will be less demand for heat. Why run up the heating bill just to be stubborn?

IT'S NOT THE COLD — IT'S THE HUMIDITY

To see how humidity affects comfort, and how humidity affects heating bills, you first have to understand a few basic principles:

- A liquid — any liquid — on changing to a gas, absorbs heat. That's why you have to apply heat to water to make it boil (change into steam). It's why your skin feels cool when wet.
- The warmer the air, the higher *percentage* of water it can hold. This is called *relative humidity*, and it can be very confusing. Try this: If some warm air and some cool air have the same relative humidity, the warm air actually has more water in it. Or this: If you were to take some warm air and cool it, the relative humidity would rise, but it would continue to have the same amount of water in it; things in the cooler air would not dry out as fast because of the relative humidity.

Or this: If you keep dropping the temperature, the relative humidity continues to rise; if it reaches 100%, the moisture then condenses out. In nature, that is what happens when it rains. If the temperature goes low enough, all the moisture freezes out, and the relative humidity drops to zero. Relative humidity is one of those things known well to weather forecasters. Next time you see one, show a little respect.

- Most people feel increasingly uncomfortable as the relative humidity goes up; by 60% we are looking for relief. At a *higher* relative humidity not as much water can evaporate from the skin, and we say that the air feels "close," or "sticky." The *lower* the relative humidity the more moisture (perspiration) evaporates from the skin, and the cooler we feel.

In comfort, a temperature of 75° at 10% humidity is the same as 70° at 40%. This is because more water evaporates from the skin at the lower humidity. Obviously, the lower temperature takes less energy to maintain. There are some other good reasons for not having the house too dry: Most doctors advise against a very dry house in winter because it over-dries the nasal passages and open the way for infections. Check with your own doctor. Too much dryness also causes the lumber in the house to shrink, leading to air leaks and other problems. If we could only have summer humidity in the winter, when we need it! (A lot of people in the dry Southwest would settle for some humidity just any old time.)

HOW TO GET MORE HUMIDITY IN THE WINTER:

- The simplest way is — you guessed it — lower the thermostat. By now know why: It raises the relative humidity with the same amount of water in the air.
- Trap the humidity inside the house that is produced anyway; don't vent bathing and cooking steam to the outdoors. (In summer you want to get rid of this humidity.)
- Add a humidifier to the heating system. In environmental matters, there is a very important principle called the trade-off. It simply means that you can't have your cake and eat it too. In this case, you can't go out of your way to produce humidity without a cost. What it costs is energy. Remember? A liquid changing to a gas absorbs heat. So if you change water to water vapor with a humidifier, you have to apply heat, which is what you are trying to conserve. So do you come out ahead? Yes, but not as much as some sellers of humidifiers would have you believe. Also, remember that there are some other reasons for correcting a too-dry house, besides saving money.
- Have a goodly number of house plants and keep them watered. Isn't this "free" humidity? No, because the water evaporating from the plants absorbs heat. The plants are a whole lot nicer to look at than plastic decorations, but the humidity isn't free. Nothing is.

Don't go overboard on humidity. Much condensation on too many windows for more than a few hours means trouble inside the walls: Water is condensing there too, and will end up causing damage. Keep tabs on the relative humidity with an inexpensive instrument called a hygrometer. (There's a fancier one with a fancier name: psychrometer.)

FOR FRESH-AIR FREAKS: If you insist on sleeping with a bedroom window open, open it from the bottom, not the top: More warmth escapes at the top than at the bottom. Also, close the door to the rest of the house.

THE ELECTRIC BLANKET, A SOMETIMES ENERGY-SAVER

True, an electric blanket uses a normally energy-expensive heating element. But it doesn't heat up much, or continuously. Compared to keeping the whole house warm at night, it costs very little — about \$1 per month. Best not to use it on children's beds. You can apply the same principle in other ways: the *occasional* use of an infra-red light or electric heater here and there, instead of heating all the house. Spend a little, save a lot.



The electric blanket: A sometimes energy-saver R.G.

A FURNACE NEEDS TENDER, LOVING CARE

Just turn it on every fall and let it go 5-10 years? No way! A furnace needs regular care, just like any other mechanical thing. Homeowners can do some — but only some — of the maintenance themselves. This may have you sticking your head into some places you never expected, but it's worth the trouble: (Do these jobs with the system turned OFF.)

- Keep it clean — especially on the heat-exchange surfaces. This is the thing that heats up the air as it is pulled through the furnace; the heat comes from the flame. Some parts are usually removable for this job. An accumulation of these surfaces acts as an insulator, and sends some of the heat up the chimney, instead of into your house. Also, clean around the air intake of the combustion chamber; lint build-up here can cost you in wasted fuel.
- Oil the motor at least once a year. Use 10w unless the motor says otherwise.
- Tighten the belt(s). Too loose wastes energy. Too tight burns out bearings.
- Change the filter(s). Once a month, more or less, depending on how fast they get dirty. A clogged filter reduces the amount of air that passes over the heat exchangers and circulates through the house. Some of the heat that was meant for the house just goes up the chimney. A fiberglass filter is NOT meant to be washed or blown out and re-used. The most you can get away with is to partially clean it once with a vacuum cleaner. The next time you will have to replace it. The only filters that are washable and re-usable are made of aluminum mesh, or a material that looks like foam rubber with big pores.
- Clean the nozzle (only on systems using #2 heating oil). Do it with a toothpick. Check the filter while you're at it.

Almost anyone can change filters. If you can't do the other jobs easily, you might as well save them for expert help, because you are going to need some anyway. Here's why: There are certain tests and adjustments that cannot be made without special equipment and knowledge. If the adjustments are not made periodically, the efficiency of the furnace slides down, costing you more and more energy-money. Some utility companies will inspect your system free; some will inspect and clean free, and some will inspect, clean, and adjust free.

Two years without adjustment is reason enough for outside help. Another is the way the furnace acts in cold weather. If the temperature is below freezing, the blower should run continuously, and the air

from the ducts should be warm, not hot. Some systems work best with the blower going all the time whether it's very cold outside or not. A good system should operate at about 75% - 80% efficiency. If the experts cannot get the efficiency high enough, the time has probably come for a new furnace. Your pocketbook will rejoice, when it gets over the shock.

BETTER BURNERS, AND BETTER BURNING

If your furnace is not as young as a spring chicken, it could profit by a new, improved burner that is more efficient than older types. Check with sales and service companies. If the furnace uses heating oil, it would benefit from an improved nozzle. A study carried out by the E.P.A. and Exxon shows that it can improve efficiency by 8%. Also, an additive for heating oil is worth trying. A small amount added to 750 gallons makes more heat, and less heat-robbing carbon deposits. A different kind of fuel adjustment. Then, if your furnace uses gas, and has a big, fat pilot, it can be replaced with an automatic lighting device that uses an electric spark. Ben Franklin would appreciate your using his invention to save some money. "Waste not, want not," he said.

HEAT LOSS AT THE CHIMNEY-TOP

If you think you are getting all the heat you pay for, you're probably mistaken. To find out, you need only check what's coming out of the chimney when the furnace is on. If it's hot instead of just warm, a lot of heat is escaping, wasted. This is more the case with older units than with newer ones. Some of the heat can be recaptured with an add-on unit that attaches to any free-standing chimney. There are several makes. Check local sources or contact: General Products Corp., 150 Ardale Street, West Haven, Connecticut 06516.

There is additional waste at the chimney of your clothes dryer. The same unit that goes on the furnace chimney can also be attached to the dryer chimney. If you have an electric dryer (NOT gas), and if it is not located too far from the living space (or garage, if you want to heat it), you can vent it to that area, instead of to the outside. It will also help the winter dryness problem.

SOME HEAT LEAKS THAT OFTEN GET OVERLOOKED

Roof ventilators and window air conditioners (the part on the outside) need tightly fitting covers in winter. Some are sold ready-made. If you make your own, canvas is a good material.

THE FIREPLACE, BEAUTIFUL AND WASTEFUL

When wintry winds are howling at the door, there's nothing like a cheery fireplace to warm hands and heart. But the trouble with most fireplaces is that they waste energy — as much as 90%. The worst kind is built of masonry, with most of the chimney standing outside the house. The heat loss is a little less if the chimney remains inside the house, and passes through the roof. Ah, but what a gorgeous waste in a fireplace! Here are some ways to have some of that beauty, and a little heat, too:

- Use the damper. The harder the wind blows across the top of the chimney, the more suction it creates. This makes more draft than needed, and wastes energy. When the fireplace is not in use, be sure to close the damper. Otherwise, the fireplace will suck heated air (heated by the furnace) right up the chimney. If there is no damper, by all means get one installed.

Suppose everyone is enjoying the fireplace when bedtime comes. You can't close the damper while there is a fire, because smoke will come out into the house. If you wait for the fire to die out, you will have a long wait. Solution: Make a *fireproof* fireplace cover. Set it in place when you go to bed, and close the damper in the morning. There are also automatic controls for this problem.

- Use the fireplace on days that are cool enough for some heat, but not enough to turn on the furnace. Especially good where winters are mild, and where spring and fall are long and fickle. Not much good in very cold weather.
- Close off the room where the fireplace is being used. It reduces the up-the-chimney loss of heat.
- Use an add-on unit to increase fireplace efficiency. There are numerous makes. Most of them draw in air from the room, and return it heated. Sample contacts: American Way Co., 190 Range Road, Wilton, Connecticut 06897; Aquaplanes, Inc., 135 Sunshine Lane, San Marcos, Ca 92069.
- If you're adding a fireplace, get one of the new, free-standing types, made of metal — they are less energy-wasteful than the masonry type. Maybe not as soulful, but better than none.

IF YOU HAVE PLENTY OF WOOD BUT NO FIREPLACE:

All is not lost. You can burn wood in certain kinds of central heating systems. A special kind of furnace will burn either wood or regular fuels, and switch back and forth. Sample contacts: M.B. Hill, Inc., Belfast, Maine 04915; Riteway Manufacturing Co., P.O. Box 6, Harrisonburg, Virginia 22801. For information about a kitchen range that can use either wood or other fuels, contact: Monarch Kitchen Appliances, Beaver Dam, Wisconsin 53916.

COOLING

THE COOLING BILL vs. THE HEATING BILL

Air conditioning gulps down about 30% of our national electric bill, year-round. How much of this can homeowners save? Probably more than on heating bills, even though indoor/outdoor temperature differences are greater in winter than summer (in most of the country).

Is this crazy? The reason is simple: Most air conditioning uses electrical energy only, and electricity is usually produced by burning something. This is very wasteful (see page 33). But heating burns the fuel directly, so there is much less waste. (Air conditioning in dry places works in a special way, and uses less electricity — see page 12.) So a little discomfort pays off better in summer than in winter. But somehow we think "energy" in winter more than in summer. So we are more careless with energy in summer, and waste more.

CENTRAL AIR vs. ROOM AIR

Central is more expensive of energy than window units, for the same reason central heat is expensive: It costs more to cool (or heat) air in one place and then send it somewhere else, than it does to produce the cooling where and when you want it. Moving is bad news for BTU's.

Is there a way out? Sell off the equipment and use the proceeds to buy window units. Installing them is pretty simple — it takes more muscle than know-how. Things do get complicated and expensive if you buy units that take 220 volts instead of the usual 110 or so. In that case, extra wiring must be installed. If your budget hesitates to make the change, good used units are often available from people who are converting to central. They don't know any better; maybe you could make a deal.

SELF-CONTROL: THE THERMOSTAT AGAIN

Each degree colder you set it results in a higher *rate* of energy-drain. For example, lowering the thermostat one degree in the 60's (degrees) takes about three times as much energy as one degree in the 70's. Is the reason for this obvious? It is the contrast between outdoor and indoor temperatures. Setting the thermostat from 68° to 78°, the savings average about 5% per degree. So a change from 72° to 78° means a savings of about 30%! Is there another way to make so much money with only the touch of a finger?

AUTOMATIC CONTROL As in a heating system, cooling equipment can be fitted with clock-thermostats (on the expensive side) or clock-timers (inexpensive). They can be used on either central or window units, and are a good way to keep heavy hands off the regular controls. They are also a way of having equipment turned off until, say, a half-hour before anyone is going to be home. This helps resist the temptation to leave it on the whole time the house is empty. And it helps keep tab on where the energy money is going. Clock-timers are especially easy to use, and usually require no installation. Check it out.

AIR CONDITIONING BY NATURE

... THE SUN, THAT IS Who would believe that you can get cooling out of heating? Well, you can, believe it or not. It works same as an air conditioning system that uses a gas flame instead of a compressor (See right). There even used to be a popular brand of refrigerator (Servel) that worked by a gas flame; it was finally priced out of the market. The principle is still the same for almost all refrigeration and air conditioning: A liquid changing to a gas absorbs heat. One type of solar air conditioning gets its heat from the sun.

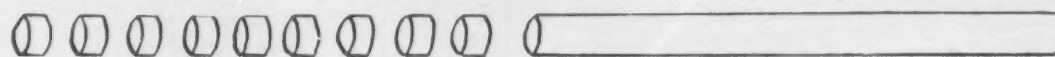
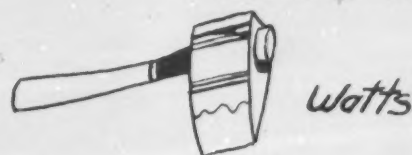
Another kind simply uses a solar heating system in reverse. Does that sound any less far-out? In winter, the system heats water by exposing it to the sun during the day; in summer it cools water by exposing it to the night air. In both cases, heated/cooled water is stored for use in the off-hours. It is all so very simple that you will wonder why someone didn't think of it before. Solar systems are now available in most large cities. (See also page 3.)

ON BUYING AIR CONDITIONING EQUIPMENT

Always, when buying something that uses energy, ask the question, How much energy will it consume? Before buying any air conditioning unit (of the more common, compression-evaporation type), find out or figure out the efficiency rating. It's easy — just divide the watts into the BTU's (both usually marked on it somewhere). A rating below 7 is wasteful, and below 6 is especially wasteful. Newer, small units may go up to 10; larger ones to 12. The newer air conditioners have higher ratings, as manufacturers become more energy-conscious. The immediate trade-off here is price: These units are more expensive because they cost more to manufacture. But in the long run, a "cheapie" costs more in energy.

If you insist on a central system, investigate the type that cools by a gas flame (it really does) instead of a compressor. The savings may run to 20% or so, depending on the price of gas. Whatever you buy, don't get equipment that is bigger than NEEDED. Dealers can usually give you honest help on this, but keep in mind that the more cooling you demand, the more energy it costs. Air conditioning energy, remember, is the most expensive kind: electricity.

How much is enough? Here is a rule of thumb: If the air conditioning system keeps the inside temperature down to 75° when it's 90° outside, that is good enough. The blower on a central system will be going continuously. If the temperature outside goes above 90°, it will go up inside too — maybe to 80° or 85° — but that will be only temporary, and bearable. If you expect the inside to be 70° when it's 100° outside, you are expecting a lot, and it will cost you a bunch. If you can afford a bunch, you are asking too much of the environment, the same as the buyer of a "cheapie." The too-big unit also wastes energy under lighter loads.



Efficiency

BTU's

Air conditioning efficiency

R.Q.

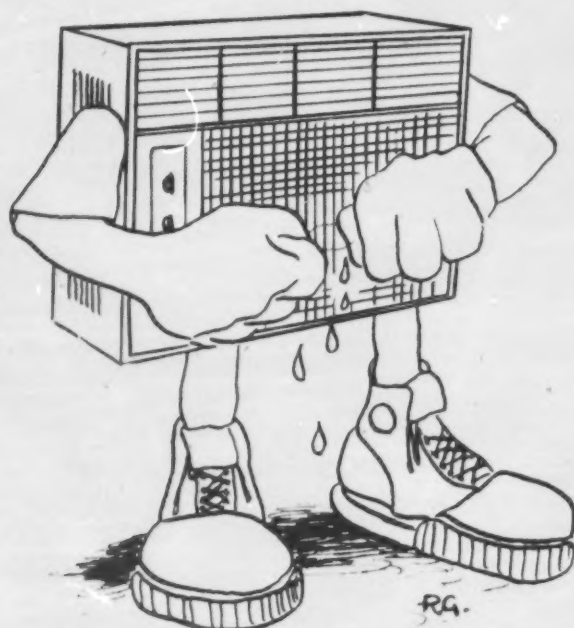
THE HUMIDITY AND THE HEAT

Remember how humidity affects the amount of heat or cold we feel (page 9)? In winter we are usually trying to get humidity in the house and keep it. But in summer the idea is to do the opposite: get rid of humidity. That is why all air conditioners (except the evaporation type used in the Southwest) not only cool, but remove humidity. That is also the reason for getting rid of humidity being created in the house by cooking, dishwashing, bathing. Try to avoid making clouds of humid air, and where possible, vent this air to the outside. Many stoves and bathrooms have power vents to the outside. Use them for short periods, or open windows where this will help.

THE DESERT AIR CONDITIONER — A CHEAPIE THAT WORKS

In the dry Southwest, and in most of the dry world, the mechanical air conditioner is the evaporative cooler. It simply pulls air from the outside to the inside, through wet pads of a porous material. No compressor is used, so it runs on much less energy than the air conditioners of more humid areas. But it works only where the air is dry — the drier the better, and usually not much above 20% relative humidity.

There are other places besides the Southwest, with several weeks of summer dry enough that some people use the evaporative cooler during those times; but the efficiency is borderline. If the humidity is not above 40% or so, you might try it, especially if you like the air humid, as humidity is added when the air is cooled. Outside the Southwest, this type of unit may be available only by catalogue.



Wringing out the air

MAKING WINDOW AIR CONDITIONERS THRIFTIER

You know that the energy bill comes out better with window units than with central air conditioning (page 11). A little management will make that difference bigger. First know that even a window air conditioner is not cheap to operate. A typical cost is about 5¢ per hour. Does that sound like a bargain? If run 24 hours a day, it works out to over \$36 a month! Figure it up. How to get more comfort for fewer energy dollars using window units:

- Try not to locate them on the South or West sides. Even if they are shaded from direct sunlight, the air on those sides of the house is hottest when you want the most cooling inside. The hotter the air near the outside of the machine, the less heat — from inside — the unit can dispel.
- Use fans to keep the air moving. A 20" fan uses about 1/7 as much energy as a typical window unit. Unless the interior design of the house keeps the air from moving freely, 2-3 window units should be enough for an average one-story house. That doesn't mean they all have to be running at once. Use them as you need them, along with a fan or two, and the comfort will be about the same as a central system using twice the electricity. Even spoiled visitors won't notice much of a difference. Remember that the idea in keeping the air moving is not only to distribute the cold air from the air conditioner, but to promote natural evaporation from the skin — which makes you feel cooler (pages 9, 15).
- On days when the weather is humid and warm, but not very hot: If you use the air conditioner at all, set it on "low." This will cut the humidity while providing some cooling. Remember that at temperatures above about 60°, humidity makes most people feel warmer.
- Close the outside vent when using the unit to cool. Most houses have more than enough air leakage to make additional outside air unnecessary.
- Keep filters clean. They should be cleaned about once a month, more or less, depending on how fast they get dirty. If you notice an immediate difference, you have waited too long.

A FURNACE PILOT LIGHT WITHOUT A VACATION

If you have done your homework on heating systems, you know that when the heating season is over, the pilot light should be turned off. It doesn't put much of a strain on air conditioning, but it does waste gas. Some are big enough to waste a lot.

IS AN ATTIC FAN "YOU?" It uses about 1/10 the energy as central air, and when conditions are right, it can be very effective. Some people wouldn't have anything else. The right conditions:

- Cool nights.
- Humidity not too high.
- Operation mostly at night, with windows open.
- Good insulation. In the morning, windows are closed, and the fan is turned off. With the inside temperature down to 70° by morning, it may not get up to 80° until late afternoon. By then, the sun will be going down soon, and a new cycle begins, with the attic fan again bringing in cool air.
- The house shaded by trees for as much of the day as possible.
- No one in the family with severe allergies to things in the nighttime air, because a lot of air is pumped through the house at night. Consult your doctor.

The system is open to some variation. For example, in certain areas, the cool period extends from midnight to mid-day, instead of night to morning. This is alright, so long as there is a period that is long and cool. Before air conditioning, some houses had special vents low around the outside of the house. The attic fan was run during the day, with air coming in that was slightly cooled by shrubbery and other plantings around the house.

Running an attic fan to relieve the air conditioning system isn't a very good idea: You end up spending more energy than you save. If you can prove that your house is different — using the electric meter — go ahead.

MORE ON BRINGING THE OUTSIDE AIR INSIDE:

Short of having an attic fan, there are other ways of using outside air to reduce the demand for air conditioning. You simply have to notice the outside temperatures. Some people will first have to re-discover the outdoors. When it is cool outside (probably late night and/or early morning) bring some of that cool inside. In certain localities the temperature drops suddenly when the sun goes down. In those places, you can start saving right away.

- Simply open a window if there is a breeze.
- Use a window fan to pull in air from the outside. These fans are also used to remove hot air from the inside. If the drop in temperature is dependable enough, the window fan can be connected to a clock-timer.
- Most window air conditioners have one or more "vent" or "ventilate" settings. This has the same effect as a window fan, although it usually doesn't move nearly as much air.

WINDOWS — A PROBLEM FOR ALL SEASONS

Remember that glass is a poor insulator. In winter they help you during the day, and hurt you at night. In summer, they hurt you during the day, and don't do much of anything at night. What you can do about them in summer:

- Leave the storm windows up year-round. But don't expect the savings on air conditioning to be as much as on heating.
- Use drapes to block out the sunlight, especially light-colored, thick ones. You may not like the looks of closed drapes in the daytime, but they will save you plenty on air conditioning — as much as 50% in the room where the drapes are used.
- Use venetian blinds. They are not "in" just now, but energy-saving is. They reflect a lot of sunlight back outside, and can be adjusted at an angle to permit seeing through. Not recommended in houses where someone is allergic to house dust, because they are great collectors of it. Consult your doctor.
- Have glass tinted, or apply the coating yourself. It reflects summer heat back out, and during winter, reflects heat back in.
- If there is a window that drinks in much sunlight, and you don't care how it looks from the outside, apply aluminum foil. Placed outside, it is super-effective.
- Use one of the newer sunscreens, made of woven fiberglass. Rather expensive, but effective. Check with home improvement companies, or look for distributors in the Yellow Pages.
- Use awnings. (See page 14).

CEILING FANS: FROM OLD MOVIES TO YOUR HOUSE

Ceiling fans are back. They are "in" and they are chic. One reason: they use less than 1/10th of the electricity of a typical window air conditioner. They make you feel cooler by that old principle of speeding up natural evaporation from the skin. Not recommended for low ceilings, but they can be used as low as 8'. They are even good for winter. The downward air-flow brings warm air from the ceiling, and in general helps distribute the heat better. A speed control is important, because you want a very low speed in winter, and a higher one in summer. The right size for a typical bedroom is 36"; for a large living area, 52". Not usually a do-it-yourself installation job.



The ceiling fan: cool and quiet

ON HAVING AN AIR CONDITIONING SYSTEM REPAIRED

Air conditioning equipment is complicated and delicate. When it breaks down, you may be in for a big expense. But NEVER let anyone work on it who is not super-qualified and honest. Otherwise it is going to wind up costing a lot more — not only in more repairs, but in wasted energy. Here is a little scenario. Has it ever happened at your house?

The weather has been getting hot — gradually. But the electric bill has been shooting up, and you notice that the compressor seems to run all the time. Finally you call a repair company, choosing one from the Yellow Pages that you hope won't cost too much. The ad isn't too big, not too little, and that's about all you can tell about the company. Soon the truck is stopping at your house, and you feel better already — after all, these people are in the business of air conditioning service, and must know what they are doing.

"No big problem, ma'am/sir, just needs some gas. Have it fixed in a jiffy." It needs a lot more than gas, but they don't tell you that. They're going to be gone in a jiffy, because they will just tap into a line on the low pressure side of the system, give it a shot of gas, and be on their way. The bill isn't too much, the system cools a little better, and you figure you got a bargain.

But then a string of hot days comes along, and the compressor is really laboring, but the house just isn't cooling enough. The fuse blows, and you call the same people again. They put in a bigger fuse. The system isn't working any better, but at least it's working.

In a few days, that bigger fuse blows, and you call your favorite fixer-uppers back. You are getting kind of chummy with them, and you just know they must be a good company — they don't take long, and they don't charge much. This time they tell you about how your system is old, and how you need a complete new system.

They have "fixed" the old one, alright, and now they will get you out of the mess by installing a new system for several hundred dollars. Or they may refer you to another company (sometimes for a kickback). They don't really want installation jobs anyway — they can make more by popping gas into systems all over town, and getting kickbacks for referrals. They may not even know how to handle an installation.

Do you actually need a new system? First, ask yourself: Are the summers really hotter than they were when the old system was originally installed? Has the house grown? Has the system shrunk?

What you really need is to have gotten competent help the first time the system needed work. A peek into the mysteries of air conditioning service will help avoid a waste of money and energy:

On that first service call, the gas really was down, but that was only a symptom. Sooner or later, all air conditioning systems develop gas leaks. But if gas gets out, air must get in, and that spells trouble. The air, along with moisture it carries, makes the compressor work harder (with more consumption of electricity), and causes internal damage. All that cut-rate outfit did by adding gas to the system was to further load up the overloaded compressor. Finally the fuses blew. You were lucky the larger fuse didn't cause the compressor motor to burn out completely. The condition of the system got worse, while the electric bill soared.

The fact is that you can't just add gas to the system without doing several other things first. Unless you want trouble. The extra work costs a lot more, but saves in the long run. A reliable company would have started by fixing the leak(s). Then they would have repaired the damage done by air and moisture in the system — corrosion and metal-transfer. Then they would have put a vacuum pump on the system to pull out every last bit of air and moisture (and old gas). This cannot be done in any jiffy — the pump will have to be left running several hours. Then they would have charged the system with new gas, using constant checks to make sure they put in the right amount.

So you see how sloppy or less-than-honest maintenance can cost you money in repairs and energy. If you do replace the equipment, do it for the right reasons: to get a unit of the right size, or to get one of the newer designs with a higher efficiency rating (see page 11).

THE ATTIC/OVEN If you don't think your attic gets hot in the summer, climb up there some warm day, and prepare for a surprise. Attic ventilators used to be little more than a few louvers (like slats) in a gable. Then homeowners discovered the industrial idea: wind-driven revolving ventilators. They help keep the temperature down during the day, and drop it faster at night. For sale everywhere.

If the attic is still plenty hot 3-4 hours after sundown, and if it's cool outside, it probably needs ventilators. Another way to tell: Feel the underside of the ceiling. If it is warm, it is acting like a weak but giant broiler, radiating heat down into where you are trying to sleep. By the time the house is comfortable, it's almost time to get up. Some ventilators have a built-in fan with a thermostatic control. These are more effective. For some families, ventilators are a do-it-yourself project, especially the fan-less type.

THE HOT, UNLIT FIREPLACE

If the damper is not closed, hot winds can blow right down into your house. If there is no damper, have one installed. Meanwhile, block off the fireplace in some other way.

OUTSIDE THE HOUSE: SOME THINGS WANTED AND UNWANTED

- **Unwanted:** a large area of pavement, stone, or sand near the sunny side(s) of the house. This acts like a solar collector, radiating heat onto and into the house. Replace with flowers or grass, or shade it with a tree or patio cover.
- **Wanted:** clinging vines. Climbing vines on the South and West walls can help cut the heat-transfer through those walls. They do this by their shade, and by evaporation from their leaves. Most of these vines are evergreens, so a little of their benefit is offset by shading in the winter. Be sure to get varieties that are right for your area. Not recommended for wooden exteriors.
- **Unwanted:** vines, bushes, or any vegetation that limits the flow of air around air conditioning condenser units. Whether of central air or window air, if it's outside, give it room to breathe. Shading it is fine, if you can do it from some distance away.
- **Wanted:** trees. See page 5

AWNINGS: ARTIFICIAL SHADE THAT WORKS

Trees are a whopping good investment in energy conservation (page 5). But what can you do if trees are not possible, or will be a long time growing to size? Try awnings. The old-fashioned canvas type may look more elegant, but the metal ones last longer, and the ventilated, metal type will be a more efficient job of letting out the hot air that gets trapped underneath. They have one drawback: If left up in winter, they interfere with solar heating through the windows. Awnings are not as good as trees, but better than drapes. It's hard to beat trees at what they do well. We can learn a lot from them.

STANDING THE HEAT IN THE KITCHEN

What *not* to do about the hot kitchen, is to crank up a lot of air conditioning equipment — or let a thermostat do it — to compensate for this one hot spot. Try:

- Closing off the kitchen, or partially closing it off.
- Using the stove's exhaust fan. Even if it is a big one, the energy it takes to get rid of that heat (and humidity) will be far less than what the air conditioning consumes to fight it. Always use the fan when cooking in the summer — if it's the kind that takes air to the outside. A ventilator that simply filters will do no good.
- Using a portable fan to reduce the discomfort.
- Holding cooking down on hot days. There are plenty of hot-weather dishes that take little or no cooking.
- Learning to live with it.
- Cooking outdoors some. What's summer for?

MIDSUMMER NIGHT'S MADNESS: HOUSEWORK FOR A COOL SUMMER EVE

Postpone hot jobs until the cool of the evening. You will use less air conditioning, or feel better, or both. Examples: canning, baking (or avoid almost entirely in the summer), dishwashing, laundering (especially if the washer and dryer are in an air conditioned part of the house).

PLAYING IT COOL IN THE GOOD OLD SUMMERTIME

Nature has given us a marvelous plumbing system, and one of the things it does to keep us cool. The warmer the body is, the more blood it sends to near the surface of the skin for cooling; and the more water in the form of perspiration. The perspiration evaporates, and cools us off — that is, the surface of the skin, and the blood passing by underneath. Remember why this works? An evaporating liquid absorbs heat. It's all so automatic that our body temperature usually holds steady at exactly 98.6° F.

Help the natural process along, and you will demand less air conditioning: Keep the air moving with fans, and wear summer clothing. Have things to eat and drink that are cool or cold (but not icy, because this confuses the body's thermostats). Try it — you'll like it.



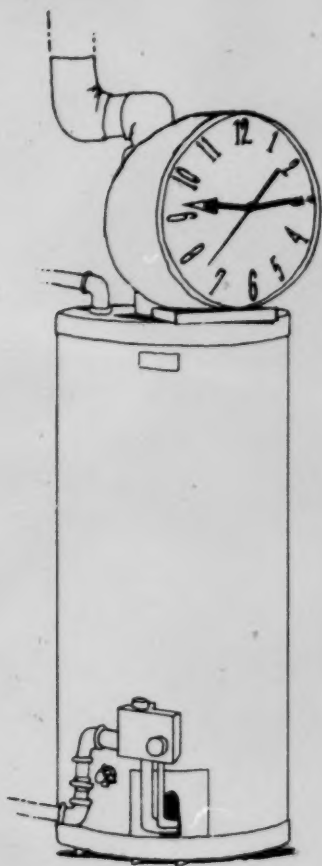
Playing it cool

WATER — HEATING

HOT WATER, A HIGH-FLYER IN THE ENERGY TRADE-OFF GAME

Hot water. Do we take it for granted? Like, do we assume that it is unlimited? That it should be available on demand day and night? That it is a necessity? That we "deserve" it? That it doesn't cost much? A peek at the energy bill may change our minds:

Hot water is the second biggest item in the home energy budget — about 15% of the total. Then is the hot water a luxury for which we have let the energy trade-off climb too high? To answer these questions, we need to look at our expectations from life, our habits, and at some new ways to heat water.



R.G.

Going on hot water hours

BUYING A WATER HEATER — THE USUAL KINDS

Until solar heaters catch on (see below), most people will continue to buy the most common types, gas and electric. Here are some energy questions to consider:

- Which costs less in your area — gas or electricity? In most areas, it is gas. The main reason is that a great deal of energy is wasted in the production and delivery of electricity (page 1). In only a few places, cheap hydroelectric power and high gas prices make electricity the better buy. Also, remember that any appliance with an electric heating element is the most energy-expensive of all.
- How much hot water does your family NEED? If the heater is bigger than needed, and if you leave it on all the time, the way most people have been doing, you will be spending energy just to keep the extra water hot.
- How thick is the insulation? The thicker the better, and some cheaper models have little, indeed. Go to the library and check consumer publications to compare makes and models on this and other features.
- If you insist on having hot water whenever you want it, you can come close to it with a "quick recovery" model. This kind will heat up a cold tank faster than the other kind, but you will pay for that luxury with a fatter energy bill.

BUYING A SOLAR WATER HEATER

To understand the possibilities, you need only to feel the water coming from a garden hose after it has been lying in the summer sun. That much heat just by accident — think how much can be had with a little management! There is nothing strange or difficult about solar water heaters. They are simple, and they have been used for decades in different parts of the world, including Florida. In Florida they fell out of fashion for the years the nation was gorging itself on cheap energy. But energy isn't cheap anymore, and solar heaters are roaring back, improved, and all over the country.

You don't have to live in Florida to use a solar water heater year-round. New designs do a lot of heating with a little sun. And with even less sun, a solar unit will pre-heat the water before it reaches the regular heater; this trims down on other energy by a surprising amount. Available ready-to-install in most large cities. The installation cost is high, but the pay-out time is 4-8 years. Then you're home-free for the life of the unit — 50-75 years. Making one is not too much for the do-it-yourself family; see magazines like, *Popular Science*, *Popular Mechanics*, *Mother Earth News*, others. Kits are also available.

If you should have a swimming pool, and if you have been heating the water with precious energy reserves, you can now heat it with a solar water heater designed especially for that purpose. They are available in larger cities of some areas. Or you can make one.

Solar power. It's energy-wise. And it's free. (See also page 3.)

KEEPING THE WATER HOT, DELIVERING IT HOT

- If the water heater is stuck out in the cold somewhere, it may need more insulation, as the tank is often poorly insulated. Just bundle it up in blanket-type insulation — the colder the winters, the thicker. It will look funny, but save you money.
- See that every inch of exposed hot water line is insulated — at least 1/2" thick. Check it out all the way, including crawl spaces.
- Locate the water heater as close as possible to the places where the water is used. If you have to move the heater, this will not be easy. Remember that a gas appliance of any kind *must* be vented to the outside; but you can put an electric heater anywhere it will fit.
- In a large or sprawling house, having two or more small water heaters makes better energy sense than one big one. Something to keep in mind when building or remodeling.

ON NOT KEEPING IT HOT Do you NEED hot water at your disposal 24 hours a day? Think of it in this way: In the history of the world, how many people do you suppose have had that luxury? How many people have it today? Which of your ancestors had it?

Most of us leave the water heater on all the time. Why? Maybe we think this takes less energy than heating up the tank from scratch. This is not so. You can prove it by checking the meter carefully: Read it after one week one way, then a week the other way. Mainly we leave the water heater on from habit; somehow we have learned just to forget about it. But there it sits, out of sight, chipping away energy dollars hour after hour, day after day. Remember that the heating of water is the second biggest item in the home energy bill.

Many families have found, to their surprise, that they don't really need the water heater on more than a couple of hours a day. The electric can easily be turned off altogether, and the gas kind as easily put on "pilot." Most, when turned back on, will catch up in a half-hour or less, even if not the quick-recovery type. A small family may discover that just a few minutes a day heats the water enough for their needs. What are your hot water NEEDS?

SOME SLIGHTLY FAR-OUT WAYS OF GETTING WATER WARM, BUT NOT HOT

Every degree you can raise the water temperature *before* it goes into the water heater, helps. But you have to use heat that would otherwise go to waste. Some ways of doing this:

- In summer, you can capture the heat coming from the air conditioning — either central or window unit. There is a special heat-exchanger now sold for that purpose.
- Also in summer: Feel the water coming from a cold water tap. It's much colder than the air, right? Why not use the air to warm the water some, instead of having it go directly from the ground into the water heater? This can be done with a simple heat-exchanger that an inventive do-it-yourselfer can make, using ordinary plumbing materials. Disconnect in the fall, when the air is cooler than the water.
- In winter, the furnace is what usually wastes heat, up the chimney. Some of this can be recaptured for pre-heating water. This is not a project that an ordinary do-it-yourselfer could handle, but it can be done. (This heat can be salvaged more easily for helping to heat the house; there is an add-on unit for this; see page 10).
- Year-round, maybe: Some people have tried to capture wasted kitchen heat by installing a bare (without insulation) water tank in the kitchen. This may or may not do some good. You would have to be sure, in winter, that the heat absorbed by the water tank really comes from the stove; otherwise, you are just adding work for the furnace. In summer there's nothing to be gained over using outside air anyway.

SOME OTHER WAYS TO MAKE HOT WATER COSTS BEHAVE

- Awareness: Everyone in the family must realize that hot water is not just water, but water plus a lot of energy. You weren't really aware of that before, now were you? Habits are hard to change, but you can help your family do it. Try putting a \$ sign on every hot water outlet in the house, including the washing machine. Silly? Saving energy is fun — or it can be — and the results are better when it is fun. Make up some funny signs, invent some rules and penalties for wasting energy; try to beat your own record (or other families' records), and have some rewards for doing it. All work and no play makes Jack a dull energy-saver.
- That thermostat — the one on the water heater: Does it NEED to be set over 120°? The difference between 145° and 120° is a saving of 25%. Just like that.
- Expensive drips: Keep faucets fixed, especially hot water faucets. A leak of one drop per second wastes two gallons a day, or 730 gallons per year! Think of heating all that water for nothing.
- Aerators: Put them on kitchen and bathroom faucets. They "spread" the water around, make you need less for running-water uses. For sale everywhere.
- Liquid rock: If you live where the water is hard, a water softener can pay for itself handsomely. It helps cut back on the customary uses of hot water in washing and cleaning. If someone in the family is on a low-sodium diet, check with your doctor, or get the new type of water conditioner that works electronically. Also, drain the sediment from the bottom of the water heater tank every few months — more often if the water is very hard. The mineral build-up acts as an insulator, and makes the heater less efficient.
- An electric money saver: Men can waste a surprising quantity of hot water by letting it run while they shave. A small amount of water can be heated on the stove with far less energy; this also limits the amount of hot water the shaver uses. (Careful of little ones underfoot when carrying hot water.) Or better still, get an electric razor. Careless use of hot water while shaving can cost several dollars worth of hot water per year; an electric razor uses only about 3¢ worth of electricity (a whole year). You can't beat that.



R.G.

Drip, drip, clink, clink

BATHING

TO BATHE OR NOT TO BATHE

How many energy dollars go down the drain at your house from over-bathing? Taking a bath is one of those things most people do without giving it much thought. It may be costing you more than you know. The first thing to realize is that a bath is a hot water bath for most people. That is what makes bathing energy-expensive.

Our ancestors said, "Too much bathing will weaken you." That was easy for them to say — they were too poor and too busy to take many baths. For sure, they didn't have hot water on tap

at any time of the day or night. What about today? Do we bathe more often than needed just because hot water and everything else is so available? Some scientists say that too much bathing really isn't good for you. Consult your doctor.

Re-think bathing in your family. Some individuals may need to bathe every day because of their work. Hard-playing kids may need at least a bath a day. Some people cannot sleep without bathing first; others can't get going in the morning without a bath. Yet in all the bathing there is bound to be some that is a habit, not a NEED.



Playing tricks on the shower

SHOWER SI, TUB, NO A quick shower uses far less water than a tub bath. If you insist on the tub, bathe less frequently. Or if you have hot water hours at your house (see page 16), wait until the end of the hot water period. When the water heater goes off, the tank will still be hot. Use it for your tub bath, and live it up.

HOW TO FOOL THE SHOWER INTO USING LESS WATER

So the shower beats the tub. But you can still do better — a lot better. If the shower head is adjustable, set it for the finest spray. That will help a little. A somewhat better way is to buy a flow-restricting device made for that purpose. It costs \$2-\$3, and fits into the water line above the shower head. Somehow it makes the water act like more than it is when it comes out. Possibly you can do as well by inserting a piece of tubing, or another non-corroding object into the line. With some shower heads you can insert a washer with a tiny opening just above the holes; on others a coin will work, with or without an opening. Sometimes you can also block off a set of holes, using washers. Don't expect big savings with any of these tricks.

The best move is to buy a specially-designed water-saving shower head, not to be confused with massage types. Several major companies make them, and they save 1/2 or better. The champion is the Nova brand — it will come closer to a saving of 2/3. It really works, and the shower you get is just as good, if not better. Costs about \$13, and you will save that much on water-heating energy the first couple of months. Contact: Ecological Water Products, 142-46 Spring Street, Newport, Rhode Island 02840.

SNAPPY SHOWER, SNAPPY SAVINGS

- Use the Navy system: Wet yourself, turn off the water, soap up, turn on the water, rinse off, turn the water off. Some shower heads have a shut-off valve so you don't have to re-mix hot and cold.
- If you must dawdle in the bath, do it in the tub. Don't stand under the shower daydreaming, while it gushes money down the drain.

CLOTHES - WASHING

CLEAN/DIRTY CLOTHES Every time a garment is worn, does it NEED to be washed? If we assume that it does, we may be asking too much of the earth's resources. Some members of the family will be more careless about this than others. Have everyone get into the habit of thinking twice before tossing something into the dirty clothes. Even the clothes may benefit: dirt is hard on clothes, but washing and drying are worse.

SOME LIKE IT COLD Do clothes NEED to be washed in hot water instead of warm? Warm instead of cold? You would probably want to use hot water when sanitation is involved — for example, in washing diapers, underclothes, or sick-room items. But for everything else, are you using hot water only from habit? Or because it just seems like a good idea, but you don't know why?

If you think the clothes come cleaner with hot water, experiment. You will probably find that you can't tell the difference if you wash white articles in warm and rinse in cold; and for the rest, doing both washing and rinsing in cold. Whether the detergent is supposed to be for cold water makes little difference. Never mind the hard-sell soap commercials — just use your own eyes and your common sense. Once in a while, check to make sure the washing machine is filling with the kind of water you think it is. If you don't want the water hot, but not enough cold is getting into the machine, you will get hot water anyway, because the machine will not start until full. It doesn't care if the water is hot or cold.

How much can you save? Just as you would expect, hot water is what runs up the energy bill in the laundry. It beats the washing machine many times over: For the energy the washing machine uses in running through a complete cycle, you can't heat more than a couple of quarts of water (with a non-solar heater). For all that difference, how much cleaner does hot water make the clothes? Any cleaner at all?

WASHING THE SAME, RUNNING THE MACHINE LESS

- The size of the load: Washing less than a full load is not energy-efficient, especially if you use hot water. If you have to wash a smaller load, when the tub has filled as much as needed, shut off the water by advancing to the next step on the timer. Or wait for a full load.

- Soaking: This can mean being able to use a shorter cycle. If there is no "soak" step on your timer, or if you want to soak the clothes longer: Just shut off the timer for as long as you want — probably after a couple of minutes into the "wash" cycle; this will give the soap a chance to dissolve before the soaking starts.
- Water-softening compounds: If the water is hard, and you have no water softener, you can reduce the washing time by using a preparation like borax or washing soda. No way of reducing the washing time, though, will compare in energy-saving to cutting back on the hot water.

CLOTHES - DRYING

DO YOU NEED A DRYER? There is a lot of advantage to having one. It does the job quickly and easily, and keeps you out of bad weather. There's also something to be said for *not* having one. It is energy-expensive — much more so than the washer, even when you wash in hot water. It's also harder on the clothes than hanging them out the old-fashioned way. Some people prefer the clothesline: It saves on their energy bills and helps the environment. They also like the bleaching and germ-killing action of the sun. And, for many, the exercise of hanging out clothes beats staring at the boob-tube, while the dryer does all the work. Our ancestors got along without such. Is our NEED for luxuries greater than theirs? If you do not have a dryer, especially if your family is small, reconsider before buying one.

THE KIND OF DRYER TO BUY

Remember that in just about any comparison between gas and electric appliances, gas wins handsomely on energy-saving. The electric dryer uses the energy-extravagant heating element. The only advantage of an electric is that it does not have to be vented to the outside; when it is vented, this is to get rid of heat and moisture, not fumes.

The spark that saves: Today most gas dryers come with an ignition-type lighter. It lights the gas with a spark when the gas comes on. This is much better than the old-fashioned pilot. With that kind of dryer, about as much gas was used for the pilot as for drying. If you still have a pilot-lit dryer, you can convert it to the spark with a kit. It's worth the trouble.

HAVING A DRYER, USING IT LESS

- Make a compromise: Use the dryer when the weather is disagreeable. At other times, dry outside.
- Near-dry on the clothesline, then finish and fluff-up with the dryer.

- Buy as many drip-dry garments as possible. With these, after washing gently, you just hang them up to dry; no dryer needed. No-press clothes also save energy because they dry faster, and avoid the energy-gulping iron.

MORE DRYER SAVINGS

- If you have one of those smarty-pants dryers with settings for both dryness and time, you will probably do better with the timing approach — especially when there are different sizes and thicknesses in the load. Try both ways.
- Don't overdry. This is an obvious waste of energy, and it's hard on the clothes besides.
- Dry heavy and light items separately, if you have enough, or leave heavy items in during the drying of more than one load. Don't bake light items, waiting for heavy ones to catch up.
- Don't overload, or underload. Both ways are energy-wasteful. Sign of the overload: when the clothes don't move around freely.
- A warm dryer uses less energy, so try not to wait long between loads. Once the dryer is warm from the first load, less energy is needed for the loads that follow.
- Clean the lint filter after each load, even though it has only a little lint. Lint filters, by the way, will give you an idea of how much your clothes are worn out by machine-laundering.



R.G.

Lightweights

and heavyweights in the dryer

COOKING

BUYING A RANGE WITH THE SMALLEST ENERGY APPETITE

Here is the way ranges stack up on energy-draw. In descending order:

- Electric, with self-cleaning oven, other extras.
- Simple electric.
- Gas, with pilots and with self-cleaning oven, other extras.
- Gas, with pilots, but no extras.
- Gas, with electric ignition, but no extras. In energy-short Europe, this lighting system has been around for years. It works the same as in the gas clothes dryer: It lights the gas with a spark when the gas is turned on.
- Simple gas. Not really much more economical than the one with spark-lighting, and more dangerous than any model with some kind of automatic lighting.

The gas range with electric ignition, but no extras, is probably the best all-around buy. If you can find a gas range with self-cleaning oven as its only extra, this may save you. The reason: Self-cleaning ovens are usually better-insulated. That means you save gas on regular baking. In general, always compare insulation when shopping around. You can get information on specific makes and models at any public library.



Tops for pots

GOODBYE PILOTS? Some fancy gas stoves have as many as four, and they can consume up to 1/3 the gas used in cooking. They also add to the air conditioning load in summer. What to do?

- Turn them down, if they are set higher than needed. There is an adjusting screw for this.
- Turn them off. This is an iffy matter, especially if there are small children or other forgetful folks around. They can turn on the gas, then go off and leave it, unlit. If there is this danger, some automatic lighting system is better — either pilots or electric ignition. If you decide to do without pilots, the kind of lighter that welders use is very handy, and is less dangerous to have around than matches.
- Convert to electric ignition, with a kit sold for that purpose. Usually not a do-it-yourself job.

WHO NEEDS AN OVEN? Unless you are very clever with one, you can come out better using the top burners only. This applies even to some traditionally oven-cooked items like casseroles, desserts, some breads. Some ways to cope:

- Use the oven only very rarely. Go through your recipes, and you will re-discover many stove-top dishes. You may find that your family likes some of these better than certain baked dishes you used to have a lot.
- Use a stove-top miniature oven. It's an old item that is coming back — and there are some newer, improved models. You simply place it over a burner, and you can use it even for pies and cakes.
- Use a toaster-oven or an electric fry-pan for small jobs. True, they have the greedy heating element, but the amount of energy that take is far less than the regular oven. You wouldn't really fire up that monster just to bake 3-4 potatoes, would you?
- Bake several things at once. This is about the only way to come out ahead with an oven. Concentrate on true oven items, like roasts, pies, breads, casseroles.
- Consider a microwave oven. There still may be a question of risk, and it is not good for all kinds of baking. For example it will not work well on anything dry. It does use only about 1/4 the energy of a regular oven, and doesn't heat up the kitchen. However, it has the disadvantage of needing more time (energy), the more you have in it. Also, if you buy one with a regular element for browning, this cuts deeply into the savings. As on all purchases, check a public library for comparisons of makes and models in consumers' publications.

IF YOU DO USE THE OVEN — SOME SAVING WAYS

- Peek less, save more. You may decide to skip some peeks when you learn that each one drops the temperature about 25°.
- Use an oven thermometer to check the thermostat. If it is not right, have it adjusted, or learn to compensate. For example, if the thermostat says the temperature is 30° higher than the thermostat, learn to remind yourself to set the thermostat 30° lower.
- Less pre-heating. It is not always necessary, even if the recipe says so. To find out which really and truly do need it, your will have to experiment. On most recipes, you will find that you can skip pre-heat and cut the baking time back 10% - 20%. If you do pre-heat, don't assume that the oven will heat up faster if you set it higher than the temperature you are going to use to bake. It won't, and you will probably waste energy chasing the temperature you really want. On a gas stove, the first time you hear the gas turn down, it's ready. On an electric with an indicator light, it's ready the first time the light goes out.
- Replace a loose-fitting oven door gasket. Do not use any material except what is sold by a reliable company for this purpose.
- "Coast" a little: Turn the oven off a few minutes before the end of the baking time. If the oven is well-insulated, there will be enough heat left to finish the job. No peeking.

SOME ENERGY-SAVING ARTICLES IN THE KITCHEN (They will pay for themselves sooner or later):

- A Dutch oven and a pressure cooker. They save if you use them on a low heat, and don't overcook.
- A coffee maker. This is another example of the electric appliance that costs little to operate because it is not used much, and consumes less energy than something else. In the case, the coffee maker takes less energy than brewing coffee on a burner of the stove. Just don't leave it plugged in.
- Utensils of the Corning Ware type. Though high on purchase price, they take less heat to cook than metal ones. Next best: copper-bottomed. Be sure to use flat-bottomed pans on an electric stove — they make better contact with the heating element.
- Reflectors. Placed under the burners, they throw more heat into what you are cooking. Some stoves come with stainless steel reflectors. For others, you can buy aluminum reflectors that will fit just about any stove. Or you can make them yourself from aluminum foil.

ENERGY-SAVING ON THE STOVE-TOP

- **Double up:** When possible, cook extra portions for later meals. Your family is finicky and can't stand to have the same thing a day or two later? Then freeze the food for a later date.
- **Fitting the flame to the pan:** Flames do not need to engulf the pan, just bathe the bottom lightly. If they come up the side of the pan, they are heating nothing so much as the air in the kitchen.
- **Simmer down:** Once a liquid is brought to a boil, the temperature cannot go any higher. Letting it boil furiously wastes energy at the stove, and in summer, adds work for the air conditioning and discomfort for the cook. Happy is the home with a comfortable cook.
- **Less water, probably:** If you use more water than necessary, energy is wasted in heating up all the extra. If you're not going to eat it, don't heat it.
- **Cover up:** Keep pots and pans covered. They use less energy that way, and put less strain on the air conditioning.
- **Cook less:** Learn minimum cooking times, and don't overcook. Or don't cook some things at all. You may discover, for example, that many vegetables — other than ones usually eaten in salads — can be eaten raw. Experiment — dare to be different. Some other vegetables need to be only lightly cooked or blanched. Bonus: Undercooking vegetables makes for better nutrition than overcooking them.
- **Leftover heat:** If you have an electric stove, you can turn off the heat 3-10 minutes before the end of cooking time. Electric elements tend to stay hot, especially in older models.
- **Hot water from the range.** When hot water is called for in cooking, the amount is likely to be small. Heat it on the range (if gas); don't get it from the hot water tap.
- **Thawing for profit:** Thaw frozen foods before cooking, preferably in the refrigerator. Why spend energy to make something happen that will happen anyway, if given a little time?

REFRIGERATING

GETTING THE MOST REFRIGERATOR FOR YOUR ENERGY DOLLAR

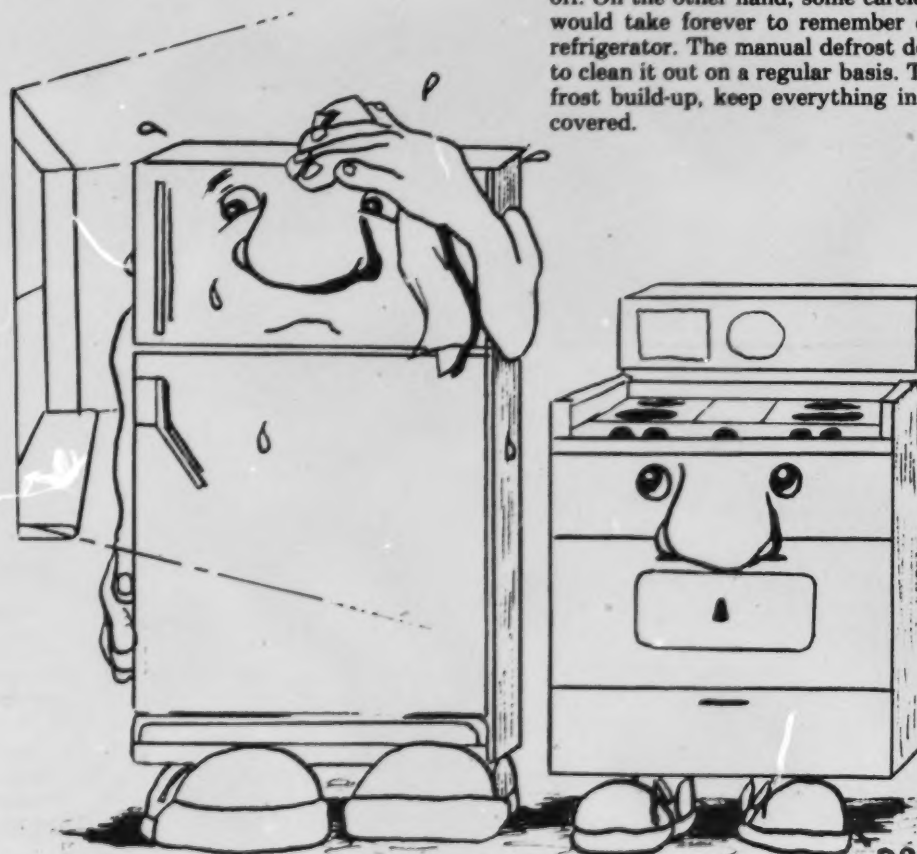
- **The extras cost energy.** That means every month. The most popular option is automatic defrost, but the energy tab is about 50% higher than for manual defrost. Why? That energy-hungry heating element again. On most models, it turns on twice every 24 hours.

Iced drinks aren't especially good for you. And if you get an automatic icemaker, you get a higher energy bill along with it. Do you NEED one? Ditto, an icewater dispenser. It may keep little ones from opening and closing the refrigerator to get icewater, but do they NEED icewater in the first place? No. Then there's the schmaltzy side-by-side model. Buying one may be a way of "keeping up with the Joneses," but resist the temptation, and you'll have the last laugh with a lower electric bill.

- **The size.** The bigger ones cost more to operate, of course. But a too-small one that is overcrowded and a too-big one with not much in it both waste energy. What size does your family NEED — both now, and for the next 5-10 years?
- **Efficiency.** As with air conditioners, manufacturers are beginning to make refrigerators with high efficiency ratings. Do most of your comparison shopping in a public library — not in the stores where you will be swayed by the "hard sell." Where else but the library will you get impartial information on how the different makes and models stack up? Like money in the bank.

LIVING WITH A MANUAL DEFROST

Defrost it when the frost gets 1/4" - 1/2" thick. Ice, like snow, acts like an insulator, and lowers the efficiency. An automatic defrost does keep the efficiency up by keeping that frost off. On the other hand, some careless housekeepers would take forever to remember cleaning out the refrigerator. The manual defrost does remind them to clean it out on a regular basis. To slow down the frost build-up, keep everything in the refrigerator covered.



The un-lonesome refrigerator

OUTSIDE THE REFRIGERATOR: SOME THINGS THAT WILL HELP THE INSIDE

- Lonesome is best: Keep the refrigerator in the coolest part of the kitchen possible. This means not only away from the stove, but also out of direct sunlight. Same for the freezer, if you have a separate one.
- Room at the back: Leave enough space behind and above the refrigerator so that air can flow freely over the condenser coils. This is where the heat is removed from inside the refrigerator is dispelled into the air.
- Lint and energy: Keep the condenser coils clean of lint and dirt — at least twice a year. This is a little job that tends to get overlooked because the coils are usually located out of sight — behind the refrigerator, or behind and below it.
- Cool it: Let hot foods cool off before putting them in the refrigerator. But don't wait too long, or bacteria will multiply fast, and the food will spoil.
- The open door: In front of the open refrigerator is no place to stare, meditate, or take a break. Every time you open the door, it is the same as taking off all of one side; cold air pours out at the bottom, and warm air in at the top. Plan ahead. Take out several of the things you expect



Daydreaming and un-refrigerating

to be using, at once. When putting back things, collect several near the door before opening it. Fast on the draw. It pays.

MORE COOL SAVINGS WITH A REFRIGERATOR

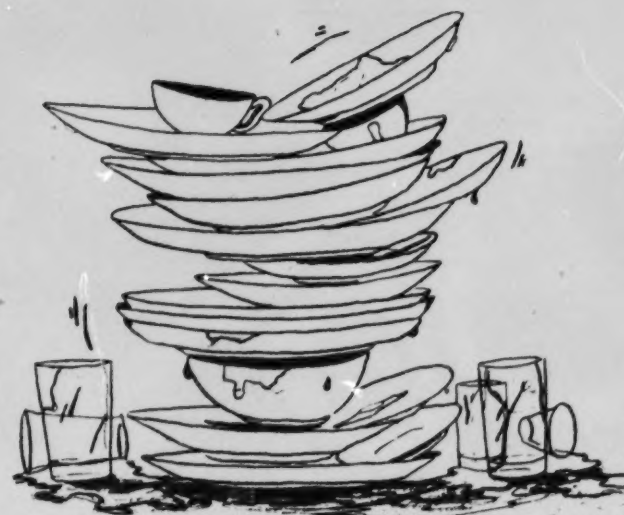
- Free the airways. Study the inside to learn how air is supposed to move. This will be obvious when you remember that cold air goes down. Then get in the habit of not putting containers where they will block the flow.
- How cold is cold? Having a refrigerator colder than needed wastes energy. Get a thermometer and check: The freezer needs to be about 0°, and the refrigerator about 38°.
- When the refrigerator sweats: This sometimes happens in humid weather, around the door on the outside. It means either that the humidity is very high, or the refrigerator is poorly-insulated, or both. The refrigerator may have a switch to take care of this. All this does is to turn on some heating elements around the door. The sweating doesn't affect the chilling inside, so if your refrigerator has this switch, avoid using it.
- The load and the bill: Remember that you get the best economy of operation by keeping the refrigerator neither too full nor too empty. Same for the freezer. Some refrigerators have a special switch for times of light load.
- The door gasket: If it won't hold a piece of paper tightly it's probably time for a new gasket. Especially watch older models without magnetic closers. Not always a do-it-yourself job, so approach with caution.
- When you're away: When going on a 2-3 week vacation, empty the refrigerator, and leave the control on the lowest setting. If you are to be gone a long time, unplug it and leave the door open.

DISHWASHING

METHODS AND ENERGY COSTS

The thing that makes washing dishes cost energy is hot water. Remember that heating water makes the second biggest demand on home energy.

- The most energy-expensive way is with a dishwasher. Do you NEED one?
- The least expensive: Wash by hand in one sink or container; rinsing in another sink-full of rinse water, or rinsing — sparingly — with a spray attachment. It's the "dishpan hands" way, unless you use rubber gloves.



Dishes and energy

IF YOU INSIST ON A DISH- WASHER:

Occasionally a family may need one, to help check an infection that is going around; the dishes come closer to being hygienically clean that way. But for everyday use:

- Try to use it only once a day — after the last meal. Large families may need it more often.
- Use a shorter cycle by scraping; or by scraping, then rinsing in cold water. In general, plate-scraping can be like a moment of truth — a test of how your family is learning to cope with the energy problem. What does plate-scraping have to do with energy-saving? Simple. The amount of food scraped off the plates is a fair indication of wastefulness in your family's habits. Along with much wasted food, expect to find high energy bills, until attitudes and habits change. A plain truth, but not really so hard to take when you think of the desperate NEEDS that many people in the world face every day.
- After the final rinse, open the lid, and skip the drying cycle. The dishes will already be hot from the water (made extra hot in most models by a heating element), and will dry soon enough. In the drying cycle, the heating element turns on again. It hastens the drying process (also helps sterilize), at the expense of extra energy.
- Remember to clean the food screen regularly.

THE GARBAGE DISPOSAL: You may think that it works best with hot water, but it doesn't. Reach for the cold water instead.

LIGHTING

HOW MUCH WE NEED Until the energy crunch, the lighting industry urged us to have more and more light — there seemed to be no limit to what we should have, or could have. Then the energy problem came along, and forced us to think harder about what we really want from life. Do we really want a world with so much energy, so much lighting, that there is no night and no day? No daily reminder of nature's might?

Have we forgotten that our ancestors read and sewed by fireplaces and kerosene lamps? If not, then we probably realize that a 60 watt bulb should be enough for just about any close work. Put that kind of light in reading and working areas, smaller bulbs elsewhere. You can direct the light where you want it by using fixtures like hanging lamps and pole lamps. Do this, instead of trying to have wall-to-wall lighting, as though it cost nothing.

HOW MUCH WE USE Lighting runs a close third to water-heating in the home energy picture. Yet it's so easy to think that lighting is cheap, considering wattages only. Take a bulb of 100 watts. We know that the cost of burning it for a whole hour is only about 1/2 of 1¢. But how those hours add up: That bulb, if left on for a year, would run up a bill of \$44! How many lights are there in your house?

DAYTIME LIGHT

- Light interiors: They reflect more light from the windows, reducing the demand for artificial light.
- Unwanted screens: Window screens cut the light by an amazing 30% - 50%. If there is a screened window you never open, why keep the screen there? Where winter days are dark, screens are usually replaced with storm windows for the season; if not, there is no point in leaving screens up — you're not going to be opening the windows anyway, and even if you did, there wouldn't be enough bugs to matter. Windows without screens also help solar heating through those windows.

DOUBLE UP Larger bulbs are more efficient than smaller ones. For example, you get as much light from one 80-watt bulb as you do from 2 bulbs of 40 watts.

KEEP THE FIXTURES CLEAN

Dirty ones waste electricity by increasing your tendency to turn on more lights. If you had a foot-candle meter, you could actually measure the difference that a cleaning makes.

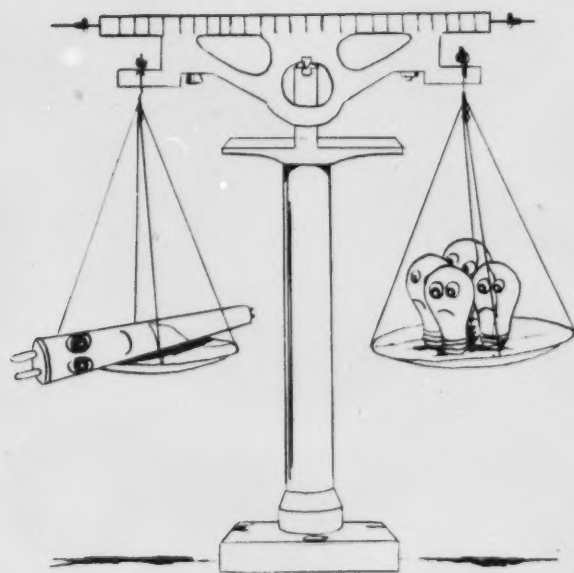


Roger Garcia

Light where you need it

SOME THINGS THAT DON'T WORK VERY WELL

- **Long-life bulbs:** They aren't what they are advertised to be. They do last longer, but they don't give you as much light. The wattage tells only how much electricity the bulb uses, not how much light it gives. If you want true long-life bulbs, you won't find them at the supermarket — but at an electrical supply store. There you can buy bulbs for a somewhat higher voltage (like 130 - 135v.) that actually use less electricity, give off more light, and last longer. Go with the best.
- **Dimmer switches:** They're a kind of fun toy, but not a very good way to save electricity. The price may turn you off, and you aren't likely to be dimming lights enough with them to make much of a dent in the electricity bill. Better just to use lower wattages, and turn them on only when needed.
- **Hidden ceiling fixtures:** These are the ones that are recessed into the ceiling, and make the light look as though it is coming from nowhere. Your visitors may be charmed, but you won't be pleased with the energy bill.



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Fluorescent vs. incandescent

THOSE FLUORESCENT LIGHTS — SOME ADVANTAGES

Maybe you have never thought of using fluorescent lights at home, but they do save energy. There are some pluses, some minuses. Probably you will decide to use fluorescent at least some.

- **Efficient:** Fluorescent is several times more efficient than incandescent: One fluorescent tube equals in footcandles (amount of light) about four incandescent bulbs of the same wattage. An incandescent bulb converts about 90% of the energy it uses into heat. In both kinds, larger sizes are more efficient.
- **Long-lasting:** A fluorescent tube lasts 7-10 times longer than an incandescent bulb (the ordinary kind).
- **Cooler:** Fluorescent puts less strain on the air conditioning than incandescent. This advantage is partially cancelled out in winter, but only partially: The electricity saved is more costly than the fuel burned to make up the temperature difference.

FLUORESCENTS: DISADVANTAGES

- **Visual problems?** Some people complain that fluorescent lights hurt their eyes. Others insist that they feel somehow weird after long exposure to it. If there is already fluorescent light at work or school and it doesn't bother you, there probably won't be any problem at home.
- **Dangerous when broken:** Fluorescent tubes are coated with a dangerous substance on the inside, and a cut from a piece of one makes a poorly-healing wound. A special consideration if there are little ones in the family.
- **Fire hazard?** Occasionally a fire starts in the ballast (transformer) of an unattended fluorescent fixture. Rare.
- **Turn-ons:** Each one shortens the life of the tube, more than with incandescent.
- **Strange color:** You may be used to the "warm" color of incandescent at home, but object to the "cool" color of fluorescent. You probably say it's OK in stores, because you've gotten accustomed to it there. Those habits, again. The way around this problem is through special warm-color fluorescent tubes, sold mostly in electrical supply stores.
- **The uglies:** You may think fluorescent fixtures look boxy and ugly. No factory lights for your home, you say. For better-looking ones, check office supply stores and electrical supply stores.

A LIGHT IN THE WINDOW If you like or need lights on when you come home, you can use a clock-timer (cost: about \$10). It will turn on a light or two for you at the time you set it. You can also use it for turning lights on and off when you're on vacation. It beats leaving on lights when they are not needed. If you want many lights turned on and off, you will need an electrician to connect an industrial-type clock-timer to the wiring.

Use outside lighting for safety — not for decoration. And those elegant gas lamps can use a lot of gas, especially when set too high. If you have one, turn it down. Or if you don't need it for safety, turn it off. If you must be elegant, do it some other way.

DRIVING

THE AUTOMOBILE — THE GREAT AMERICAN DREAM MACHINE

Oh, to slide behind the wheel of a sleek, new automobile, and be whisked away to our destination, effortlessly and smoothly. We aren't just driving a car; we're showing off, for all to see how rich and glamorous we are, how smart, how powerful. Nothing is too good for our cars; no sacrifice too great; no cost too high. How did we get into this love affair with the automobile? Perhaps by being bombarded with automobile advertising for so long.

The fact is that an automobile is just a machine. It's dangerous, it's expensive, and it burns up more energy than we can afford. Would you — dare you — have a look at the automobile stripped of its glamour? Then walk through a junkyard. There you will see them, these fallen angels, mangled and bent, broken and rusted, the magic of showroom and advertising gone forever.

We need not hate the automobile to live with it, only see it for what it is: a machine to move us from one place to another. Automobiles have a staggering energy appetite. The consume — directly — 13% of all the energy we spend in the United States. But there's more: The energy used in manufacturing them equals 1,200 gallons of gasoline each. Then more energy goes to ship and display them, and make and stock replacement parts for them. The equivalent of 1 gallon is spent in the refining and delivery of every 5 gallons for sale. The total bill comes to 25% of all our energy consumption. Taking the 13% that goes for gasoline directly, it turns out to be the #1 energy expense for many families — even passing heating and cooling.

WHEN YOU BUY A CAR If you really and truly NEED one, what you buy will determine more about energy-saving than how you drive it. Some things to consider:

- **Weight:** The most important factor of all in gasoline mileage. Chop the weight in half, and you double the mileage. The big trade-off is safety, because heavier cars have more metal to absorb the impact of a crash. Of course, the more people who buy small cars, the less chance of having a collision with a big car.
- **Number of cylinders:** How many do you NEED? Probably no more than six, maybe no more than four. More cylinders means more gasoline, not

only because of the engine's appetite, but because of all the extra weight that usually goes with it. There may be special conditions. For example, if you expect to be pulling a boat or trailer, or if the family is big, a too-small motor won't handle the load.

- **Air conditioning:** It cuts mileage 10% - 20% mostly by the drag of the compressor, and a little by the extra weight.
- **Automatic transmission:** It reduces mileage 2%-15%, partly from the way it works, and partly from the weight.
- **Axle ratio:** It is the ratio between gear sizes in the differential. Automobile manufacturers try to strike a balance between power and economy. One way they do this is with a compromise axle ratio. The standard is 3.73. A somewhat lower ratio can be special-ordered for a few dollars extra, and gives 2%-5% better mileage. Some salesmen may confuse you with terms like, "higher economy axle." If you want an axle that delivers better mileage, the *number* is what must be lower. Not recommended if the car is to be used for much trailer pulling, hill-climbing, or carrying heavy loads.
- **Diesel engines:** They give mileage that is 15%-25% better, and run on a cheaper fuel than gasoline. They are noisier and smoke more, although the smoke is less harmful than the fumes of gasoline engines. They're dependable and thrifty workhorses, the engines in all those 18-wheelers on the highways. But they are not available at a popular price — yet. Detroit will have a few optional diesels in 1978. Or you can buy a Mercedes — for at least double the price of an American make.
- **Luxury accessories:** All added equipment cuts in on the mileage, if only by reason of weight. Do you NEED power steering (not desirable in small cars), power brakes, power windows, power seats, adjustable steering wheel, fancy radios and stereos, and the like?
- **Shape:** Yes, shape. The more boxy, the lower will be the mileage, because of wind resistance. More a factor with pickups and motor homes, than cars.
- **Sticker mileage ratings:** They don't tell the whole story. For more details, get, "Miles-Per-Gallon" and, "Gas Mileage Guides for Car Buyers" (special edition for California). Some dealers may have copies, or write to the Environmental Protection Agency, Washington, D.C. 20460.

GASOLINE

- **Octane:** Don't buy a higher one than needed, just because it seems like a good idea. Follow the manufacturer's recommendation, or experiment a bit, down the octane scale. For example, you may find that, while your car is supposed to use premium, it will get along fine with some regular mixed in (especially if you don't use the car in a hilly area). You may be able to alternate half-tanks of regular and premium. If the resulting octane is too low, the engine will "knock" or "ping" under a strain. Use unleaded gasoline only if your car is supposed to have it.
- **Overfilling** usually results in spillage — not just at the station — but dribbling out as you go down the street. This is not only waste, but more pollution for the air. Or don't fill up, then park the car in the hot sun. The heat will expand the gasoline, and cause some of it to drip out: gasoline expands about 1% for each 5° of temperature rise. That means that a 20-gallon tank that is completely full, and then goes through a 15° temperature rise, would expand by over 1/2 gallon. That is how much would be spilled. Beware.

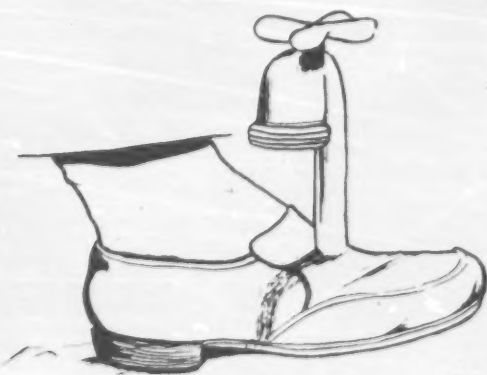


The Great American Dream Machine

YOUR RIGHT FOOT AS A MONEY-SPIGOT

You must become aware — really aware — of what you do with the gas pedal and the brake. A nervous foot costs you money.

- **Start off right:** You don't have to creep away from a stop, but don't lurch off like a jackrabbit. With some overpowered stick-shifts, you can start in 2nd.
- **Stay back:** Following too closely means needless braking. Every time you brake, you waste the energy it took to reach the speed you had. Stay out of heavy traffic, and avoid wasteful stopping and starting.
- **Maintain a steady speed:** Hold it steady at 30 mph - 45 mph, and get the best mileage from most cars. You wouldn't poke along a freeway at those speeds, but do the best you can with other routes. On some streets the traffic lights are synchronized in one direction or the other. If the traffic is not heavy, you can keep a steady speed, and not have to stop for a light. Avoid accelerating. Every time you step down on the accelerator, you throw in an extra, big squirt of gasoline. Do this enough times on your way to the store, and you'll waste enough gasoline to get back home.
- **On the freeway:** Keep the speed under 55. Several things combine to give you better mileage at lower speeds. The mileage drops at higher speeds because of wind resistance — it takes a lot of energy just to whack all those air molecules out of the way. This is so important that the higher the speed, the less important are all other elements in the mileage picture. To be exact, if you double your speed, you don't double the air resistance — you quadruple it. That's a good reason not to use a roof rack; it may look great, but it drags through the air, and lowers the gas mileage. Want a demonstration of how "thick" air is? Put your hand out the window at 50 mph, and see for yourself.



Your right foot, money-spigot

- **Uphill:** Never accelerate when going uphill, if you can avoid it; this is the most wasteful thing you can do. Don't even try to maintain all your former speed — expect to go more slowly uphill (Who are you trying to impress?). Use the truckers' trick: When approaching a hill, speed up some (if legal). This may keep you from having to downshift; at least it will postpone it.
- **If you're going up a steep hill, or pulling a load uphill,** shift to a lower gear when the engine is obviously straining. You will use less gas, and the engine won't heat up as much.
- **Downhill:** Never try to save gas by coasting completely free. Always have the motor running, and the transmission in gear. The other way would save some gas, but could cost your life.
- **Use no lower gear than necessary:** With an automatic transmission, if the engine is going faster than needed, ease up on the gas a bit, and let the transmission shift to a higher gear. The automatic slips less in high gear, except when under a strain. Learn your car, and you will recognize the sounds and feel of what is going on. Another way is with a vacuum gauge (See page 27).

WHAT DO YOU DO WITH YOUR LEFT FOOT?

Some people with automatic transmissions have the habit of "riding" the brake pedal with the left foot. Other drivers, using standard shift, "ride" the clutch. Both practices waste gas and lead to expensive repairs.

LIVING WITH AN EMISSION CONTROL DEVICE

You may have heard that disconnecting it is a neat trick for increasing the gas mileage. But there are some good reasons for not disconnecting it: Doing so may decrease the mileage instead, it can cause engine damage, and it's against the law. True, the e.c.d. is a strange bird, but better things are on the way, from both Detroit and abroad. So do everything else right, and hang on.

IDLING AND WASTING Is your car very new? Or the weather very, very cold? If the answer to both is "no," then there is no need for a warm-up of more than a few seconds. The gasoline mileage is extremely poor when the engine is cold, but you can salvage a little by getting underway as soon as possible. Go slowly at first, where you can do so safely; a distance of five miles or so may be needed for warming up in very cold weather.

Idling a hot engine is no bargain either. Don't idle longer than for a stop at a traffic light. Extra gas is not needed to start a hot engine — you don't even have to pump the accelerator.

STRATEGY AND SAVING Think ahead, plan ahead, and save. The idea is to avoid needless stops, delays, changes of speed — they cost you money. Study your often-traveled routes until you know them like a bus driver: Which traffic lights change in time to which others? Which hours of the day is the most traffic going in which directions? Where do bottlenecks develop? What are the habits of most other drivers?

Try to work the lights in your favor without breaking the law or being dangerous. Watch the cars far ahead — not just the one directly ahead — for signs of approaching stops and slow-downs. Even study the pattern of oncoming traffic. What does it tell you about lights that are ahead, but out of sight? Learning to pick up information like this will make you not only a thriftier driver, but a safer one as well. It's fun. Kind of like "driving" all the cars on the road.

Avoid rough pavement when you can — it takes more gasoline than smooth. Also to be avoided: driving in snow or rain. Yes, even rain makes a difference: The more water on the road the more energy the tires use to squish it out of the way.

Figure out the best ways to solve difficult traffic problems. For example, suppose you're trying to make a left turn onto a busy two-way street, and there is no light on the corner. Don't try it. You'll just make everybody mad, including yourself. Instead, turn right. As soon as you can, make a left turn, and go around the block. Then when you make a right turn, you will be going the way you wanted all along. This may seem like a lot of gasoline to spend, but at least you're getting some motion out of that gasoline, and the problem is getting solved. The other way, you will just be sitting there idling, and idling.

When you get anywhere near the place you're going, and you see a parking spot, grab it. Don't keep cruising around looking for a better one. If you ever find a closer one, it won't turn out to be as close as you think. Besides, the walk will do you good.

Planning a long trip? Then really plan it. Figure out which routes are the shortest, over the best roads. Know just what you're going to do when you get to large cities, and try not to make it during rush hours. Write Chambers of Commerce ahead of time, to learn exactly how to arrive at the places you are going to visit. And yes, even plan on the winds — they make more difference than you would think. The wind blows mostly in certain directions at certain times of the year, in certain areas. You get such information — where else? — at the library. If you were taking a bicycle trip, you wouldn't think of ignoring the wind.

MAINTENANCE AND ENERGY

Find and cultivate a good mechanic, who will do only the work your car needs, and do it right. The often-recommended "complete tune-up" is seldom needed. Find out exactly what is needed, and take care of that only. Doing-it-yourself is not hard. Someone in the family — not necessarily male! — can probably handle it. The big exception to this is carburetor overhaul, something not often required anyway. The most commonly needed: points, plugs, ignition wires, timing adjustment. Other routine maintenance to take care of or have done:

- **Air filter:** If it's dirty, it chokes off air to the engine, makes it burn more gas.
- **Oil:** A gasoline engine is definitely not an efficient machine. One reason is that the moving parts are so numerous. They must be lubricated, and if it is not done right, the engine wastes energy and wears out faster. If the oil is too thick it wastes gas, and doesn't lubricate properly; the same for oil that is too thin. The solution? Use a multigrade oil like 10-40 or 20-50; it adjusts its thickness to the temperature. When buying any oil, always buy the best (SE rating) — it costs more, but it's worth the difference.
- **Dirt makes oil thick,** so change it when it gets dirty; change the filter with at least every other oil change. But you can't depend on just watching the oil for dirt. Gasoline can leak past the rings, down into the crankcase. There it dilutes the oil, and makes it too thin to lubricate the way it should. One thing that causes this is a lot of stop-and-go driving. Another is an engine with worn rings from high mileage (like over 50,000 miles). You can't over-change oil, so be on the safe side, and change it often.
- **Automatic choke:** Needs cleaning, lubrication with a special lubricant, sometimes adjustment. It should be closed only when the engine is stone-cold.
- **Tire inflation:** Keeping tires inflated slightly above the recommended pressure helps the gas mileage. Some people run their tires far above pressure, with added savings. But this is dangerous — it can blow a tire out and cause an accident.
- **Brake adjustment:** If too tight, this makes a constant drag that wastes gas. Do not adjust too loose, though; this increases the danger of not being able to stop in time.
- **Wheel alignment:** Incorrect alignment causes the front wheels to drag. This wastes gas, wears out the tires. Especially watch toe-in, toe out.
- **Wheel bearings:** If the grease becomes old and hard, it causes some drag. Have re-packed with fresh grease.

- **Exhaust manifold valve:** Check to see that it is not stuck. Can be done easily when the car is on the grease rack.
- **Automatic transmission fluid:** Keep it up to level. The farther down it goes, the more the transmission slips.
- **Cooling system thermostat:** It can become defective, and not let the engine heat up fast enough. Remember: a cold engine wastes gas and wears out faster.
- **Traveling to, or moving to the mountains:** If you're going to be there for an extended period, have a mechanic make the needed adjustments. The same goes for changing from a high altitude to sea level.

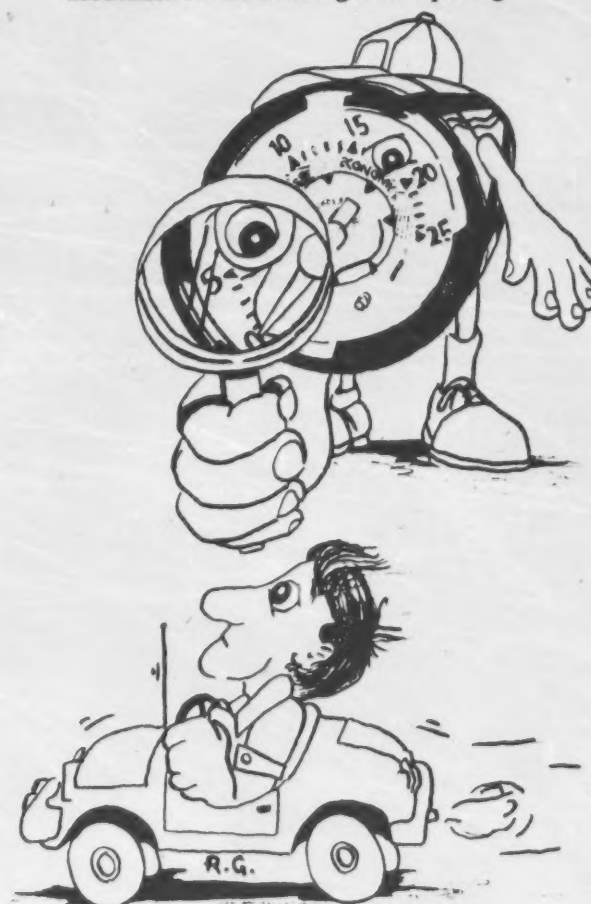
TWO GAUGES THAT TELL YOU THINGS YOU NEVER DREAMED

You know those ads for gadgets to make your car save gas? Well, they don't work, so keep your money in your pocket. The reason they continue to be sold is that people keep seeing the ads, and *think* they work. In fact some of those things can not only make the gas mileage worse, but can damage the engine. Sooner or later, the law will catch up with the rip-off artists who sell them. What really matters in gas mileage, after the size of the car, is the performance of your foot and the engine. Two instruments are available to tell you that, and they are well-worth the money:

- **Vacuum gauge:** It is a simple instrument that sells for about \$10. You mount it on the dash, and it tells you at a glance how efficiently the gas is being spent, and certain conditions of the engine. Easy to install yourself, or any mechanic can do it for a small charge. It will amaze you, because it will uncover wasteful driving habits that you didn't know you had.
- **Miles-per-gallon meter:** If you have an especially greedy gas-guzzler, or a flat-fronted motor home, or if you are pulling a flat-fronted trailer, or if you just want to know, spend another \$25, and get one of these. More complicated than a vacuum gauge, it includes a miniature analog computer. Try local automobile supply stores, or write J. C. Whitney Co., 1917-19 Archer Ave., Chicago, Ill. 60680.
- **Something that doesn't work very well,** is an automatic speed control. About the only person that will be helped by this is the one who travels long distances a lot, does it in sparse traffic, and has a nervous foot.

TIRES

- **Buy radials:** Just as the advertisements say, they do give better gas mileage — 3% - 10% — by offering less resistance to rolling. They cost more, but they will easily pay the difference. Belted-bias tires are a poor second choice.
- **Snow tires:** They really aren't very good for snow, although some people insist that they are. The main problem with them is that they are very bad on gas mileage, so try to hold down on using them. Chains are even worse on mileage, but putting them on and taking them off is less trouble than changing tires back and forth. The best way to deal with snowy weather is to avoid driving in it.
- **Oversize tires:** You can get more or less the same effect as a lower axle ratio (see p.) by using tires with a larger diameter. On the rear is where it matters, but for the purpose of rotating tires, you would buy a whole set. It will make the car look a bit funny, but it will save gas. As with a low axle ratio, not recommended for a car that is used much for hill-climbing or load-pulling.



The nose/helpful vacuum gauge

EXPENSIVE COMFORT: Using the air conditioner drops the mileage by 10%-20% (p. 25), so use it only when NEEDED. One thing that runs this figure up is bad maintenance — charging the system with gas without first emptying it (p. 14). NEVER try to do this yourself. If you have one of those do-it-yourself kits that are sold all over the place, *throw it away*, because it is EXTREMELY DANGEROUS.

Having windows open lowers the mileage a little — by creating an air drag — but nothing compared to running an air conditioner. One option is to buy the special solar screens for automobiles that used to be popular before air conditioning. In a very dry climate, the evaporative cooler that clamps onto a window is still sold. It makes some air drag, but the energy cost doesn't come close to running the compressor of a regular air conditioning system.

IS THIS TRIP NECESSARY? That was a familiar slogan during World War II, when everyone was asked to save energy by avoiding unnecessary trips. Today, do we really NEED to make all the trips we think we "have" to? We can often combine, shorten, postpone, or avoid them.

- Combining trips: Most errands are for short distances, and many short trips, one at a time, add up to a lot of gas. It's like 2 plus 2 coming out to 5. If you want 2 plus 2 to equal 3, then plan extra errands together, one after another. That way you don't make an extra trip home after each one, and don't waste gas re-warming a cold engine.
- Shortening — avoiding trips: Do you really save anything by driving to a supermarket for a couple of items? The prices are higher at the small, neighborhood stores. You know that. But have you figured on all the costs of driving to the supermarket, even just the gasoline alone? Assume that the streets are safe, and that you are not ill. Walking to the neighborhood store could be better for your health, your budget, the environment, and the nation's energy supply. Think, before you turn that key, "Is this trip necessary?"
- Avoiding trips: Almost without noticing, we have acquired the habit of jumping into our cars for any and all errands. Doing some shopping by mail carries less temptation to overbuy — you aren't dazzled by a store full of merchandise. Just be sure to buy NEEDED items, not novelties.
- You can avoid other trips by using the telephone. Suppose you are going to buy something, and there are five stores that may have what you want, at the price you would pay. Instead of going to all five, call them first. You may find that only two have what you are looking for. Go to only those, and you eliminate three trips. Let your fingers do the driving.

THE ONE-CAR GARAGE Some people with a regular-size car have thought to save gasoline by buying a second car, a compact. Their plan: use mostly the compact, and keep the big car only for outings and trips. A great idea, but it usually doesn't work. They end up on the go more, and spend more gas than ever. Why? Because when the compact's being used, it's so tempting to take the big car, instead of waiting. Our habits again. Some families may have enough self-discipline to make the plan work, but only some.

OTHER WAYS TO AVOID OVERWORKING THE FAMILY BUS

The best gas-saving trick of all is to leave the car at home. Try these:

- Mass transit (bus, subway, commuter train, "el"): Usually better for going to work than for errands. Give yourself time to get used to it, and you may come to like it. Think of the other benefits, aside from not wasting energy, if you stop driving to work every day. You won't be wearing away your mental gears on traffic tie-ups and the bad manners of other drivers. Instead, you can catch up on your reading, talk to someone interesting, study, think up something creative, perhaps meet your future mate.
- Carpooling: Most cars used for commuting contain — you guessed it — only one person, the driver. Even if you carpool with just one other person, that cuts in half the gasoline you spend in getting to work; with four, each of you spends only 1/4. If every commuter belonged to a carpool of three, the national savings would reach 11 billion gallons per year, about 15% of the total we now use. Carpooling. It saves. It gives you another set of excuses for getting to work late.
- Biking: Most people's health stand to benefit, but be warned: Bicycles cause more accidents each year than anything else. Many small communities are safe enough to ride a bike almost anywhere; in some, bike-riding is a tradition, as in Europe. But in most cities, traffic and dogs make it almost impossible; we have brought this on ourselves, by making the car king. Some cities have thoughtfully provided bike lanes. There will be more, only when we demand them.
- Walking: It can save more than gasoline. If the walking is safe (the traffic and dogs, again), the exercise can save your life. Rediscover your feet, and save.

THE IDEAL VEHICLE FOR CITY DRIVING Consider the internal combustion engine, how wasteful it is. Half the gasoline it consumes, it spends on just overcoming the friction of all its moving parts. Add the amount it squanders in wasted heat, plus what it takes to run the water pump, fan, and alternator, and you've got a rolling, monstrous, energy-gobbler. Then there is pollution. No amount of jiggering will ever remove harmful emissions completely. All these are defects that cannot be designed out; they're in the nature of the brute.

Imagine this: an automobile that is so simple that it has only two bearings as its moving parts; it's highly efficient, absolutely clean and quiet, and does not have to draw on any precious petroleum reserves. That car is here, which is to say it is back; it is the electric. They were common until the 1920's, when they lost out to the internal combustion engine, which was more powerful. The 1920's were also when the American oil boom really got rolling. The new electrics have improvements, and more are around the corner.

So far, they are limited mostly to small cars, which have been converted. A few are built from the ground up. If you want to convert a small car, and if someone in the family has plenty of mechanical and electrical know-how, contact the Electric Auto Association, 1674 Merrill Drive #12, San Jose, Ca. 95124. If the know-how is less, you can buy a kit to convert a small car. For information about kits, and about electrics that are ready-to-go, contact The Electric Vehicle Council, P.O. Box 533, Westport, Connecticut 06880.

The big drawbacks to electrics are its low power and short range. Don't expect to wheel one out on the freeway, although there are some with a top speed of 60; for most, the maximum is 30-45. How far you can go between charges depends on the car and the kind of driving you do. As a rule, expect a charge to last between one day and one week of ordinary commuting and errand-running. There is much ado in this field. Numerous experiments are underway with new kinds of batteries and hybrid power plants that would make the electric usable on long trips. Who is doing all this? They run from garage-tinkers to major companies both here and abroad. The days of the gasoline engine are numbered, and the electric is an idea whose time has come . . . back.

To charge the batteries (for pennies), there are ways of producing electricity without harming the environment or wasting petroleum reserves. The simplest is with the wind (p. 2). Even in areas where the wind is not very strong, there is enough to keep up the batteries of the family electric when it's not in use. Every home with its independent transportation system. Let the petroleum barons put that in their oil wells and smoke it.

IGNORING THE BOOBS, YAHOOOS, AND OTHER ASSORTED ENERGY-WASTERS

Being a determined energy-saver is not always easy, especially when it comes to driving. You have seen all too many drivers of the other kind — the ones who act as though there were no such thing as an energy problem. There you are, nursing your car along carefully, and staying within the speed limits. You know you are right because the speedometer tells you so (and the vacuum gauge if you have one — see p. 27). They "attack" you by barreling up to your rear bumper, or angrily zooming around you in a cloud of pollution and dirty looks.

Some of these individuals have an arrogant streak; others honestly don't know of the need to conserve energy; most are simply self-centered persons who have not yet bothered to change their habits. The same ones litter, pop their gum, and talk when they should listen. At home, they expect others to pick up after them, waste food, and throw away things that are still usable. Such people often say that what they do with their money is nobody's business but their own. And if you ask them about energy-saving, they will assure you that they know all about it.

What are you as a driver to do about these individuals? That depends on how daring you are, and on how good a driver you are yourself. Sometimes you can stay out of their way by maneuvering or by choosing better routes. If you decide to stand your ground, you may — or may not — be taking a chance. You will have to decide. When enough people learn to do the right things, then it will all be easier.

ENERGY - SAVING VACATIONS

- See America first — your state, your locality: Funny thing about our habits. We tend to take for granted the people, places, and things around us; then to ignore them, and finally put them down. We do this with the place we live, our school and job, and yes, even our home and loved ones. It is a thoughtless thing, wasteful, unfair, and even cruel. But with new eyes for our surroundings, we can learn to appreciate their better qualities. Nothing and nobody is perfect. Not far from home there is probably an abundance of places to visit — not halfway around the world, not even half a country away.
- Take the train/bus/plane: The private automobile is the most energy-expensive way of all to travel. The family that tries one of the others can save, meet some interesting people, and relax (what's a vacation for?). And it will be a welcome relief from listening to the kids squabble in the back of the family bus. They will be so stunned by the change, they will be on their best behavior.

SOME NIT-PICKING BARELY WORTH MENTIONING

- Extra baggage: Since any extra weight adds to the gasoline bill, check the trunk or in the back of the pickup for miscellaneous junk that isn't being used. In winter, keep the frozen slush knocked off.
- Keep it light: Automobile paint that is light in color reflects more heat, reduces the demand for air conditioning. But the difference is only slight, because the real villain in trying to keep the inside cool is the great amount of window area,

some of which is nearly horizontal. Anyway, light colors are safer, because they can be seen better at night.

- The "feather touch": Professional drivers talk almost mystically of developing a "feather touch" on the accelerator. This means establishing a steady speed, then easing up on the gas ever so slightly, without losing speed. You can't really spend less gas without going slower, but anything that will remind you to go easy on the gas is bound to help. If you want to know for sure what your foot is doing, get a vacuum gauge (page 27).

MISCELLANEOUS

CLEANING UP

- Cold water cleaning: Don't just assume that hot water is needed for cleaning; some cleaning products even work better in cold. Read the instructions, and you will find that hot water is seldom mentioned. Experiment.
- The vacuum bag: When it's full, the machine's pull is weaker. So you run it longer, and use more electricity.
- Vacuum-less cleaner: How much do you NEED a vacuum cleaner? The typical energy pull is about 600 watts, but a hand-operated carpet sweeper uses none. You can use it for routine and light clean-ups. Hotels and restaurants use them; that tells you they work.

and expect there to be enough food for our grandchildren? How much, and hope for independence from the oil barons? There may be some very hard choices ahead, perhaps some changes more drastic than we imagine.

Meanwhile, as we work on long-term solutions, we can begin to turn ourselves around and head in the right direction. For example, there are ways of having an attractive yard without running a mini-farm for throw-away grass:

- Replace the present lawn with slower-growing grasses, like zoysia or floratum. Check with local nurseries.
- Plant at least part of the yard in something else. Not all ground covers require cutting, or much care of any kind. Vegetables are another possibility. They are not only useful, but many can double as ornamentals.
- Fertilize naturally: For example, compost, manure, leaves, grass cuttings. Petroleum is the main ingredient in chemical fertilizers.
- Use hand tools: With a nation full of people who are overweight and under-exercised, do we NEED power edgers, power hedge trimmers, power grass trimmers? In fact, a great number of yards are small enough to make a power mower unnecessary. Old-fashioned push mowers are making a comeback.
- Grow a vegetable garden: If you do it right, you will harvest more than vegetables: A reduced demand on fertilizers and insecticides (most are made from petroleum), exercise, fresh air, sunshine, a renewed respect for nature, and a savings of about 4/5 on the cost of the vegetables.
- Learn, learn, learn: For an eye-popping treasure of information on environmentally-sane yards and gardens, see the monthly magazine, *Organic Gardening*. (33 East Minor Street, Emmaus, Pa. 18049.)

YARD WORK

- The lawn/farm: The most popular lawn grasses use up the most energy, partly because they grow so fast. The energy expense of a lawn comes in producing fertilizers and insecticides for it, pumping water for it, running lawnmowers to cut it, and if it is gathered for pick-up, gasoline for the trucks. These are only some of the obvious energy costs. There are others, some that are hidden.

The amount of energy isn't very great, compared to other ways we spend energy. The important thing is that energy is being taken to grow something that is just thrown away. You might say that today the food chain starts and ends with petroleum, because it has become central to every step in the production of food — from fertilizer to transportation of the produce. The process is about the same in the cultivation of lawns. In a world where millions starve, how much can we waste petroleum like this, and still claim moral leadership of the world? How much,

POWER TOOLS AND POWER Keep cutting edges sharp. Dull tools waste electricity by having to be run longer to do the same work. Make sure that extension cords are heavy enough for the machine you are using. If the cord is too tight (it will feel warm), it wastes energy, and is dangerous.

THE BOOB TUBE

- Do you NEED it? Life is so terribly vast and complicated that we will never understand more than a tiny fraction of it — we need all the help we can get. Now think hard about television. What have you to show for all of it you have ever seen? Have you learned much that is helpful? Challenging? Has it inspired you? Has it shown you many things worth knowing about the world? Has it made you a better person?

If it flunks on helping you understand life, and only rots your mind, then why watch it? Habit. By shaking the habit, you could save both money and mind. But maybe you can't bring yourself to kicking television out of your life completely. Or maybe you're a rare individual who watches only the 10% of programming that is worthwhile. If you're buying, here is how the different kinds compare on energy-draw:

- x - Black and white, solid-state
- 2x - Black and white, tube type
- 3x - Color, solid state
- 5x - Color, tube type

- Instant-on, constant waste: This feature is an example of how we have come to expect instant convenience, with the cost tacked onto the energy bill. The cost isn't much, but it's still energy, it's a constant drain, and it's NEEDless. Instant-on means that some circuits in the television set are always turned on and warmed up, even when the set is turned off. You can have a television shop modify the set, or remember to unplug it after each use.

DISCOVER OUTDOOR RECREATION

There is an outdoor world far in idea from snowmobiles and motorcycles, from dune buggies and motorboats, automobile races and electric guitars. It is a clean outdoors, where the only sounds are the whispers of nature. You can hike in it, or bike in it, swim in it, or camp in it. It is a place to catch hold of truth, for nature neither makes nor pardons errors. It is all yours without the furious expense of energy. Discover it.

SOME INDIRECT DO'S AND DON'TS

DON'T OVERBUY The American marketplace — was there ever such a staggering variety of goods and services? What (oh, what) would our ancestors say? They wouldn't believe it; the communists don't believe it today. It is a marvel of the ages, but if we overwork it, we waste energy. The reason is simple: manufacturing takes energy. If we continually overbuy things we don't need, we will end up not having things we do. Check the spending habits at your house. What is your family buying that it doesn't NEED?

DON'T WASTE Throw something away, and you make a ripple in the energy problem: Energy is spent in disposing of it, and if you buy a replacement, there goes more energy. If you buy cheap products that wear out fast, and then replace them with more of the same, this keeps the cycle churning, and the energy wasting. Or if you waste water, you waste the energy to pump it. The best prevention for all this is learning to be thrifty in general; do that, and you will be thrifty with energy.

DO SUPPORT COMMUNITY PLANNING BASED ON ENERGY-SENSE

- Example: High-rise buildings drink up about 1/2 of all the electricity produced in this country. Does your community NEED high-rise buildings?
- Example: The uncontrolled growth of cities is making the energy problems worse, and other problems as well. What efforts are being made in your city to slow down that growth, and breathe new life into the center of the city?
- Example: In some cities, transportation is energy-wasteful because the mass-transit system is sick, and/or the traffic patterns are out of date. What is being done to improve transportation in your community?

DO SUPPORT ENVIRONMENTAL ORGANIZATIONS

All are working for energy-independence and a safe environment; most are doing so sensibly. Some have junior divisions, or ways for younger folks to help. Organizations are important because they bring people together to exchange ideas and plans on how best to get business and government to act.

DON'T POLLUTE, OR SUPPORT POLLUTERS

Pollution follows energy-waste like a shadow: Where you find one, you find the other. This applies to individuals, to governments, to industries. It's a matter of attitude. If you are selfish you will litter. You will pollute. You will waste energy. There is little difference when a city dumps raw sewage into a river, or a company contaminates the air and water. You can control yourself. Can you control governments and corporations?

Yes! Communist governments are always calling themselves the "People's Republic" of this, and the "People's Republic" of that — an empty phrase in those countries. But in the United States, we have immense power over what happens in both government and business. We don't have to support a government or a politician who ignores pollution and waste, and we don't have to buy the products of a company that does not behave. We need only decide what should be, speak up, vote, and it will be so.

DO SUPPORT THE DEVELOPMENT OF ALTERNATE ENERGY SOURCES

The least promising of all is nuclear. The most promising is solar. See pp. 3.

DO SUPPORT THE RECOVERY OF WASTE

Today we produce 5 billion tons of trash and garbage a year. Think of it. Five billion tons! Most of it is truly wasted, because it is simply dumped onto landfills and covered with dirt — layer after layer. New York City long ago ran out of land for it, and takes it out to sea to dump it. It is also wasted in the sense that it costs energy for its collection, and gives nothing in return to most of us. That's most of us. A few communities both here and abroad recover much of it for recycling, and even make a handsome profit on it. They recover energy in the process, and reduce the taxpayers' burden.

What is recovered? Almost all of it — paper, glass, and metals, and whatever remains is pulverized and used as fuel in power plants. Limbs, grass cuttings, and the like can be composted and sold as a natural fertilizer and soil conditioner. Even sewage can be processed into (odorless) fertilizer — some cities have done it for years. These are only some plain, routine things to do with wastes, using old technology. Experiments are underway on some far-out ways for using it to help in our energy problem.

DO SUPPORT "ONSITE POWER GENERATION"

This is a plan to locate electric power plants near concentrations of people, like shopping centers, apartment complexes, schools. The idea is to heat those places with heat from the power plants. Most make electricity by burning fossil fuels. But in the form of waste heat, they lose 2/3 of the energy in the fuel. (Add losses in the transmission lines, and the waste reaches 3/4.) Nearly all the plants are now located in isolated areas. Change will be costly, and will need public support. But in the end, it means big energy savings.

DO HAVE YOUR SURPLUS MONEY WORK FOR ENERGY INDEPENDENCE

You *do* have a surplus, unless you spend every penny you make. Anybody — but anybody — can invest in American business. Just buy one share in a company for as little as \$5, and you are an investor. If you don't have that much tucked away, cut some corners for a month (lay off the junk food, for example), and you will. With it you can help shape the future, and perhaps make a profit, too. It's the American way. There is a growing number of companies that are working for energy independence and a better environment. They are developing solar energy systems, pollution control systems, components for electric vehicles, waste recovery systems, and the like.

See a stockbroker. If you've never been in a brokerage office before, don't let that stop you — most stockbrokers are small investors. Take General Motors, for example. Do you think that its owners are a handful of super-rich? If so, you will be surprised to learn that there are over 1,750,000 shareholders in that company alone. Think of mailing out that many dividend checks every three months! So take heart. March right in with your \$5 or \$20, or whatever, and put it down for a plunge into the great American free enterprise system. You can share in making it the backbone of an energy-independent future.

DO READ Do you want to save money? Do you care about energy and the environment? Do you want to learn independence? Then you need help, but you won't find much in the mass-media. You will, in publications like *Mother Earth News*, *Popular Science*, and *Organic Gardening* (covers more than gardening). There you will find a wealth of information on hundreds of products, developments, and do-it-yourself projects. Try them, and you will discover help, opportunity, challenge, and a vision of what the future can be. If you can't afford subscriptions, head for the library, ever your friend and helper.



Outdoor recreation and energy-sense

ABOVE ALL, THINK POSITIVELY, ACT POSITIVELY:

I AM ONLY ONE,
BUT STILL I AM ONE.
I CANNOT DO EVERYTHING,
BUT STILL I CAN DO SOMETHING.
AND BECAUSE I CANNOT DO EVERYTHING,
I WILL NOT REFUSE TO DO THE SOMETHING THAT I CAN DO.

—Edward Everett Hale (1822-1909)

annual energy requirements of household electric appliances

The estimated annual kilowatt-hour consumption of the electric appliances listed in this handy reference are based on normal usage. When using

these figures for projections, such factors as the size of the specific appliance, the geographical area of use and individual usage should be taken

into consideration. Please note that the wattages are not additive since all units are normally not in operation at the same time.

average wattage est. kwh
consumed
annually

food preparation

Blender	300	1
Broiler	1,140	85
Carving Knife	92	8
Coffee Maker	894	106
Deep Fryer	1,448	83
Dishwasher	1,201	363
Egg Cooker	516	14
Frying Pan	1,196	100
Hot plate	1,200	90
Mixer	127	2
Oven, microwave (only)	1,450	190
Range		
with oven	12,200	1,175
with self-cleaning oven	12,200	1,205
Roaster	1,333	60
Sandwich Grill	1,161	33
Toaster	1,146	39
Trash Compactor	400	50
Waffle Iron	1,200	20
Waste Dispenser	445	7

food preservation

Freezer (15-21 cu. ft.)		
chest type, manual defrost	—	1,320
upright type		
manual defrost	—	1,320
automatic defrost	—	1,985

average wattage est. kwh
consumed
annually

Refrigerators/Freezers

manual defrost,	—	700
10-15 cu. ft.		
automatic defrost,	—	1,795
16-18 cu. ft.		
automatic defrost,	—	1,895
20 cu. ft. & up		

laundry

Clothes Dryer	4,856	993
Iron (hand)	1,100	60
Washing Machine		
(automatic)	512	103
Washing Machine		
(non-automatic)	286	76
Water Heater	2,475	4,219
(quick-recovery)	4,474	4,811

comfort conditioning

Air Cleaner	50	216
Air Conditioner (room)	860	860*
Bed Covering	177	147
Dehumidifier	257	377
Fan (attic)	370	291
Fan (circulating)	88	43
Fan (rollaway)	171	138
Fan (window)	200	170
Heater (portable)	1,322	176
Heating Pad	65	10
Humidifier	177	163

*Based on 1000 hours of operation per year. This figure will vary widely depending on area and specific size of unit. See EEI-Pub # 76-2 "Air Conditioning Usage Study" for an estimate for your location.

average wattage est. kwh
consumed
annually

health & beauty

Germicidal Lamp	20	141
Hair Dryer	381	14
Heat Lamp (infrared)	250	13
Shaver	15	0.5
Sun Lamp	279	16
Tooth Brush	1.1	1.0
Vibrator	40	2

home entertainment

Radio	71	86
Radio/Record Player	109	109
Television		
black & white		
tube type	100	220
solid state	45	100
color		
tube type	240	528
solid state	145	320

housewares

Clock	2	17
Floor Polisher	305	15
Sewing Machine	75	11
Vacuum Cleaner	630	46

EDISON ELECTRIC INSTITUTE

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